IN TWO SECTIONS—SECTION ONE

THE PAPER INDUSTRY and PAPER WORLD

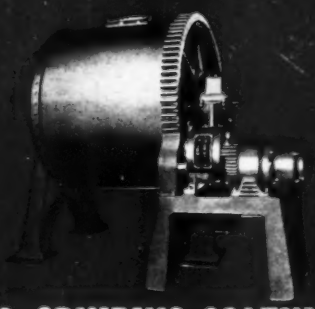
APR 16 1940

AN EDUCATIONAL NEWS MAGAZINE—APRIL, 1940

PATTERSON

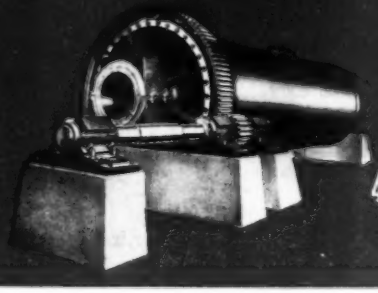
SERVES THE MODERN PAPER MILL IN 4 OUTSTANDING WAYS

1. AGITATING STOCK



2. GRINDING COATINGS

3. MIXING PASTES

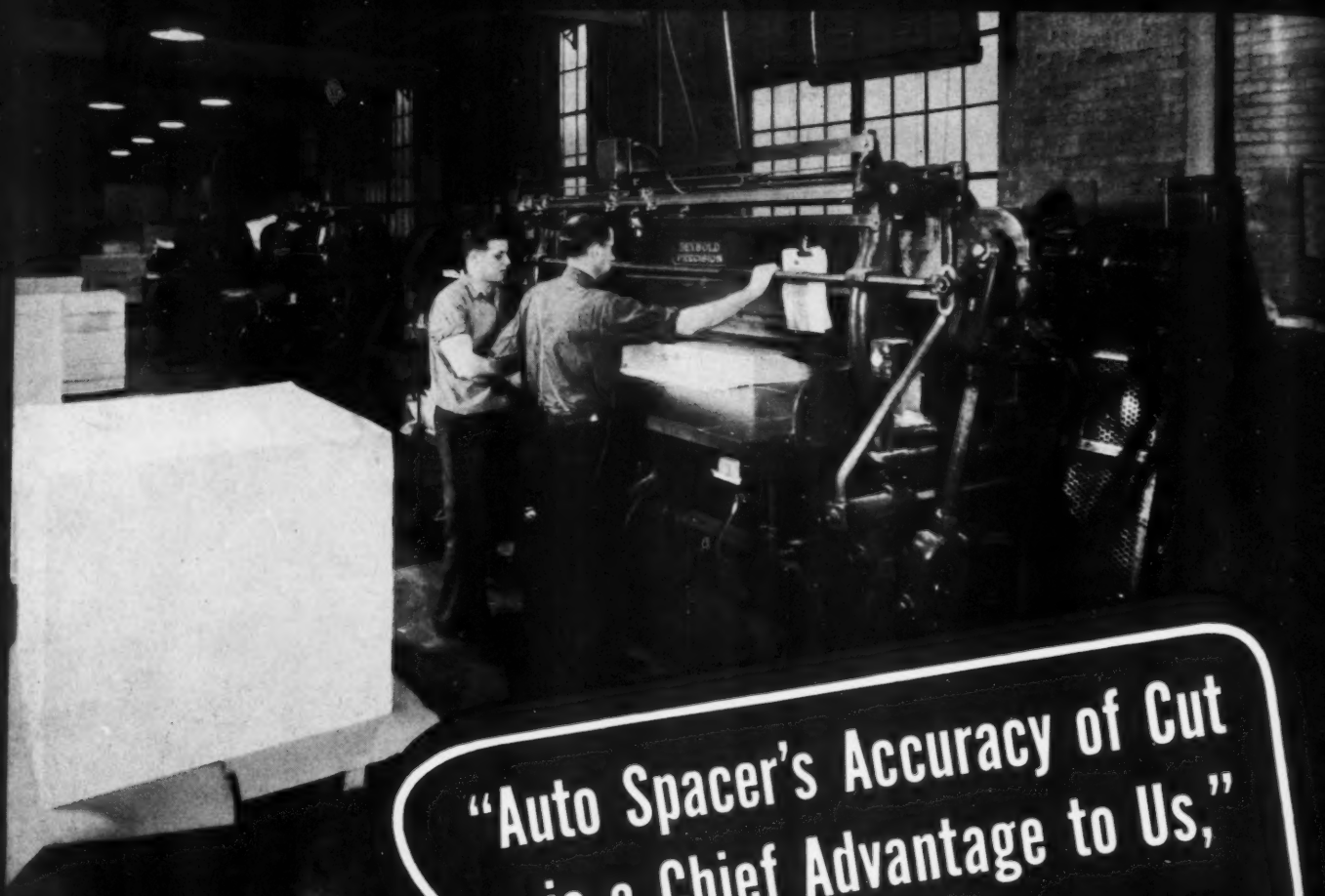


4. CALCIUM CARBONATE GRINDING, PRECIPITATING, OR BOTH

In addition to these standard and widely employed Patterson products for the paper industry, we also build special equipment for blending fibers, chemical pulp, wood flour, fillers, binders for molding compounds, plastics, cellulose, etc., etc. We invite you to investigate the extent of our capacity to serve you. Let *us* have your problem!

Richard L. Cameron
President

THE PATTERSON FOUNDRY & MACHINE CO.
EAST LIVERPOOL, OHIO, U.S.A.



"Auto Spacer's Accuracy of Cut is a Chief Advantage to Us,"

SAYS VICE PRESIDENT E. F. BEARCE OF CHILLICOTHE PAPER COMPANY

Shown here is the 84" Seybold Electric Auto Spacer in operation in the Chillicothe Paper Company's Mill at Chillicothe, Ohio.

What is the Electric Auto Spacer?

Leader of the Seybold line, this machine provides rapid, accurate spacing to any desired widths, as well as precision cutting. The back gauge moves forward automatically after each cut and a light flashes when the pile is ready for the next cut. Thus the machine itself sets the pace—not the operator. Unexcelled for multiple and repeat work, the Electric Auto Spacer is also an all-purpose machine, as the snap of a switch disengages the spacing mechanism and converts it instantly into a standard cutter with power-operated back gauge.

"The Seybold Electric Auto Spacer has been operating very satisfactorily for us," reports Mr. Bearce. "We find that it is especially advantageous on large size sheets. The accuracy of the cut is one of the chief advantages."

Chillicothe Paper Company's experience with the Electric Auto Spacer is similar to that of many other American and Canadian producers of high-grade papers, on which accuracy of trimming is extremely important.

In the eight years since its introduction, this Seybold machine not only has proved its value as a precision trimmer but has frequently aided in increasing cutting department production, particularly in cutting to small sizes, in some cases as much as 50% to 75%. The 1940 Electric Auto Spacer, incorporating new and improved features, stands unequalled as the world's finest, fastest, most accurate mill trimmer.

If you want to size and trim paper more efficiently, at lower cost, you should know this Seybold machine. Let us mail you a catalog. We should like an opportunity also to demonstrate with figures how an Auto Spacer may handle your work better, faster, more cheaply. It costs you nothing to investigate, so just drop us a line.

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823 WASHINGTON STREET • DAYTON, OHIO

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SEYBOLD HAS THE EDGE

PAPER CUTTERS • BOOK TRIMMERS • DIE PRESSES • KNIFE GRINDERS • DRILLS • WIRE STITCHERS

THE PAPER INDUSTRY and PAPER WORLD

VOLUME 22
NUMBER 1
APRIL, 1940

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HARRY E. WESTON,
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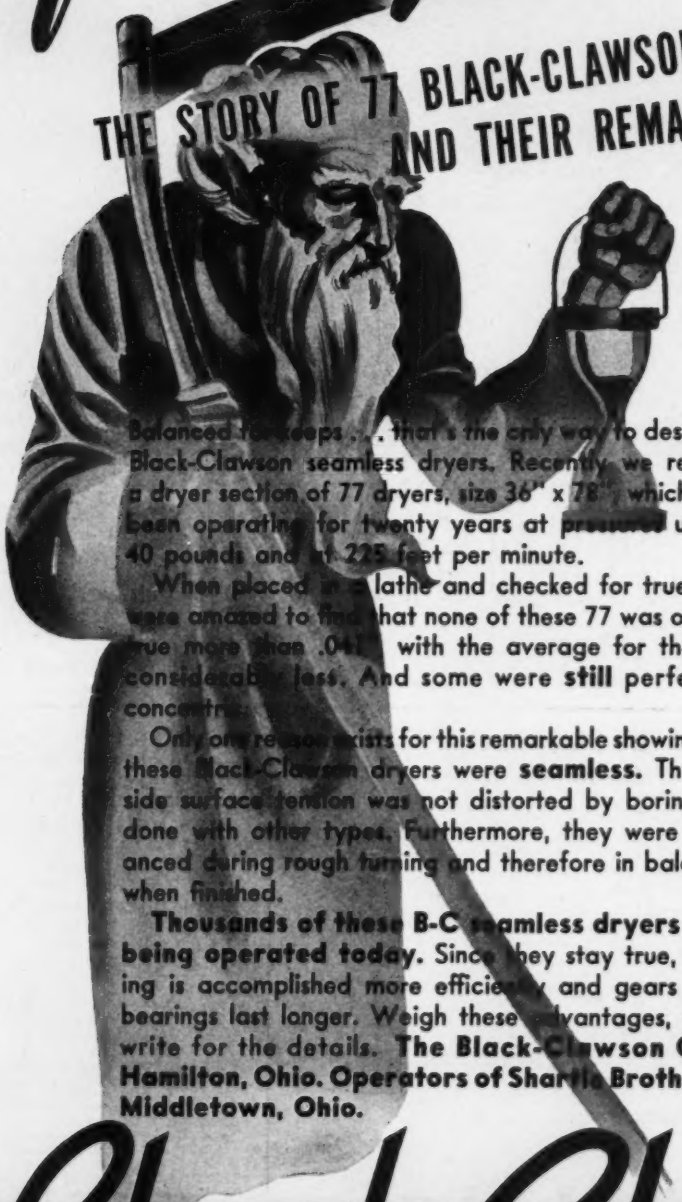
Fooling Father Time

THE STORY OF 77 BLACK-CLAWSON SEAMLESS DRYERS AND THEIR REMARKABLE PERFORMANCE RECORD



Balanced to a hair's . . . that's the only way to describe Black-Clawson seamless dryers. Recently we rebuilt a dryer section of 77 dryers, size 36" x 78", which had been operating for twenty years at pressures up to 40 pounds and at 225 feet per minute.

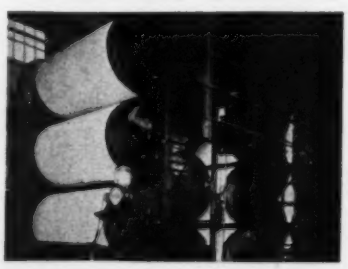
When placed in a lathe and checked for true, we were amazed to find that none of these 77 was out of true more than .04", with the average for the lot considerably less. And some were **still** perfectly concentric.

Only one reason exists for this remarkable showing . . . these Black-Clawson dryers were **seamless.** The inside surface tension was not distorted by boring as done with other types. Furthermore, they were balanced during rough turning and therefore in balance when finished.

Thousands of these B-C seamless dryers are being operated today. Since they stay true, drying is accomplished more efficiently and gears and bearings last longer. Weigh these advantages, then write for the details. **The Black-Clawson Co., Hamilton, Ohio. Operators of Shartle Brothers, Middletown, Ohio.**

B-C SEAMLESS DRYERS FOR HIGHER PRESSURES

Built by Black-Clawson, not only for drying paper, but for ironing and milk machines, textile dryers, and other industries requiring high drying pressures.



B-C SEAMLESS DRYERS FOR GREATER HEAT TRANSFER

Inside surface, being unbored, retains glass-like, rust-resistant film. Less rust means greater transfer of heat.

Black-Clawson
SEAMLESS DRYERS

GIVE YOUR PAPER "A GOOD START IN LIFE"...

USE GENERAL CHEMICAL ALUMINUM SULFATE

Quality paper depends to a large extent on the quality of the chemicals used in making it. General Chemical Aluminum Sulfate—either the Standard or Iron Free grades—assures quality in your paper from the start . . . through carefully controlled manufacturing standards that insure uniform quality and concentration and a low percentage of impurities.

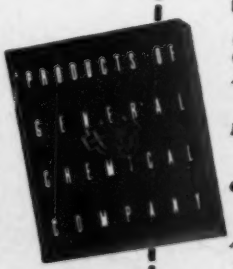
GRADES

Standard—Ground—99% thru 8 mesh, 95% thru 10 mesh

Iron Free—Ground—thru 8 mesh

General Chemical Company is equipped to supply your needs from a nearby plant, or from any of the number of General Chemical distributing stations conveniently located from coast to coast.

HAVE YOU RECEIVED YOUR COPY OF THE GENERAL CHEMICAL PRODUCTS BOOK? SEND IN THE COUPON TODAY! ➡



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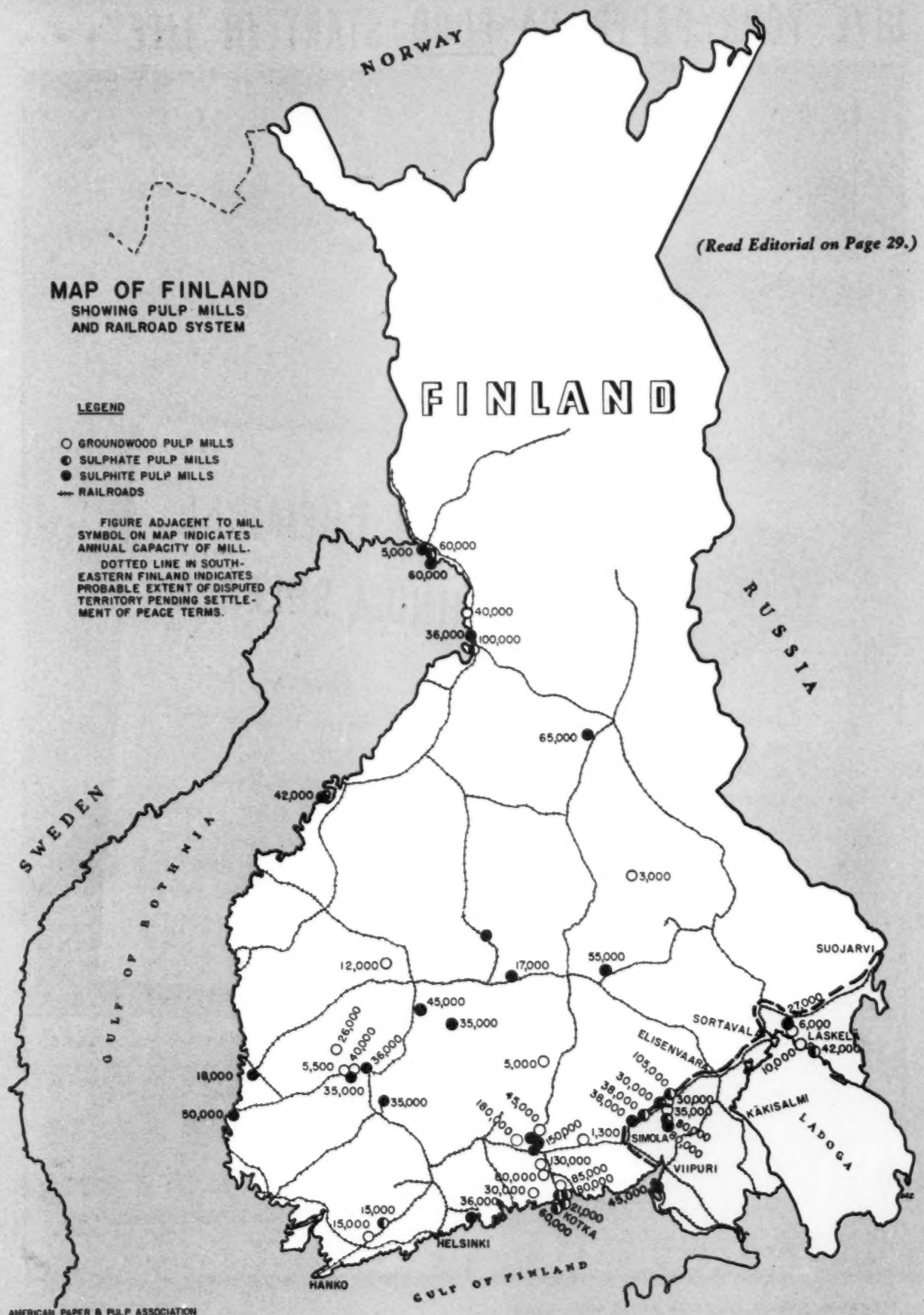
Suomi—"Land of Lakes and Forests"



(Read Editorial on Page 29.)

AMERICAN PAPER & PULP ASSOCIATION

TENNESSEE VALLEY MILL AWAITS SEC APPROVAL

▸▸▸ APPROVAL OF FINANCING operations by the Securities and Exchange Commission is all that is needed for the Tennessee Valley Paper Mills, Inc., to start construction of its $4,200,000 plant at Savannah, Tennessee.

The newly-organized company whose board members consist largely of southern business men will manufacture newsprint from Tennessee slash pine.

Details of the company's operations have been outlined by S. W. Duggan, Knoxville, treasurer. Mr. Duggan said that upon obtaining SEC approval, the company will issue 60,000 shares of no par value common stock all of which will be sold promptly when issued. It will also issue $2,350,000 in debentures.

Officers of the firm are: Chairman of the board, Maj. George L. Berry, of Pressman's Home, Tennessee, former U. S. Senator, and president of International Printing Pressmen's and Assistants Union; president, Gordon L. Browning, of Huntingdon, Tennessee, former Tennessee governor; vice president and sales manager, Captain R. M. Davenport, New York; treasurer, S. W. Duggan, Knoxville realtor; members of the board of directors, Paul Mountcastle and Wayne Parkey of Knoxville, Mercer Reynolds and C. D. Little of Chattanooga, T. F. Hassell of Clifton, Tennessee, and Robert Guinn of Savannah, Tennessee.

The firm will purchase outright more than 100,000 acres of timberland in West Tennessee, principally in Hardin county. The plan will be to start at one end of the tract and cut only the large trees. After the first cutting is completed in some 12 to 15 years, the smaller timber passed over at the start will have reached maturity and the cutting will begin all over again. In this way a policy of conservation will be followed.

As the tracts containing this timber consist largely of worn-out, well-eroded land, officials of the firm see a means of putting this land to use and by frequent replanting and careful selection of timber to keep it in perpetual use. Meanwhile large patches not now productive will be planted and brought back into production.

By developments of a similar kind in other areas of the South, a steady cash crop for owners of southern timberland is foreseen.

Selection of Savannah as site for the big plant was made because of the proximity of timber and because of accessibility of the Tennessee River with its deepened channel which will be used to float barges containing finished newsprint to cities throughout the Middle West and as far east as Pittsburgh.

The newsprint will be purchased by newspaper in these cities which heretofore have relied largely on newsprint produced by Canadian companies and which in the past have enjoyed almost a monopoly in the United States newsprint market. Increasing undependability of newsprint imports from Scandinavia because of the war, which have accounted for 20 per cent of national consumption, is understood to have some publishers worried.

The new company already has received offers of contracts calling for its entire newsprint production over the next five years at prevailing market prices, one official explained.

Savings to be enjoyed by southern publishers will come largely through reduction of the freight costs from Canadian points of origin. Not only will southern publishing plants be nearer the new source of supply, but the low water transportation charges available through use of the Tennessee River and adjacent streams will be substantially lower, officials said, than the prevailing rail rates.

Building of the plant will mean much to the town of Savannah, county seat of Hardin county, with a population of 1,129 in the 1930 census. Houses for approximately 800 employes will be built. Hotels, restaurants, motion picture houses, schools, a dock, must also be provided. About eight months will be required for construction of the plant, which, with equipment will represent an investment of about $4,200,000. Local labor will be employed wherever possible. Power will be purchased from the Tennessee Valley Authority.

The new plant at Savannah will be of about the same capacity as the plant at Lufkin, Texas, which started operations last January 17. These two plants are said by the firm's officials to fill a vital need among publishers of the South.

Executive offices will be at Savannah, Tennessee, and most of the firm's officers will spend the greater part of their time there.

Left—George L. Berry, Chairman of the Board.
Right—Gordon Browning, President.

"TESTED PAPERS" GETS PROMOTION WORK STARTED

Extensive promotion work for Tested Papers of America, Inc., recently-organized marketing organization (cf. THE PAPER INDUSTRY AND PAPER WORLD, p. 642, Sept. 1939), is now under way with the placing of advertising in several national magazines.

According to an item in *Advertising Age,* Tested Papers of America, Inc., represents the first effort made to sell a complete line of various household papers under one brand, although many successful ventures have been made by individual companies marketing single products.

One of the most ingenious of the organization's marketing promotion features is the "paper depot,"—a wire-constructed stand containing the various household papers for use in retail stores. Distribution of the household papers will be in grocery, drug and department stores. Several sound slide films have been prepared for promotion of the "Tested Papers" idea by paper merchants who will sell the idea to retailers.

◆

CAN. RAILWAYS HANDLE MORE PULP AND PAPER

The volume of pulp and paper products and pulpwood handled by the Canadian railways this year continues well above the level of 1939.

During the week ended March 16, 1940, 2,662 cars of pulp and paper products were loaded as against 1,967 in the corresponding week last year. On the same comparative basis, pulpwood loadings totaled 1,635 as against 1,099. For the year to date the Canadian railways have handled 27,520 cars of pulp and paper products, a gain of 5,902 over the same period last year. Loading of pulpwood at 22,203 compares with 15,711 cars up to March 18, 1939.

◆

RECOMMEND MINIMUM RATES FOR INDUSTRY

The recently-appointed committee under the Fair Labor Standards Act (cf. THE PAPER INDUSTRY AND PAPER WORLD, p. 1236, March 1940), decided to recommend a minimum wage rate of forty cents an hour for the pulp and paper industry by a majority vote taken March 22. This is the highest minimum wage which can be ordered under the Act and is the objective set by Congress in the Act for all American industries engaged in interstate commerce or in the production of goods for interstate commerce.

Should this rate be approved by Administrator Philip B. Fleming after a public hearing in which interested parties may appear in support or opposition to the proposal, it would increase the hourly wage rates of approximately 8,500 employees now receiving less than forty cents per hour. The industry as a whole employs about 130,000 workers.

◆

B. C. INCREASES PAPER OUTPUT

Reports indicate that the war has dealt a swift blow to lumbering in British Columbia but that it has been a blessing thus far to pulp and paper production. There are also indications that war will bring a large-scale expansion of plywood manufacture to the Canadian Pacific coast.

Since the beginning of the year, British Columbia sawmill production has been reduced about 25 per cent and further curtailment is likely, not because the United Kingdom, the Number 1 market, doesn't want B. C. lumber, but because she has other more pressing uses for her ships.

On the other hand, pulp and paper shipments have advanced greatly. The Powell River Company and Pacific Mills are both supplementing their newsprint output by the installation of equipment for the production of unbleached pulp, having found a widespread demand for this product.

◆

NEW FLINTKOTE PLANT IN MISS.

A new plant for the manufacture of a complete line of wood fiber decorative and structural insulation and wall board products is to be built in Meridian, Mississippi, by the Flintkote Company. Construction will start promptly and delivery of the finished product is scheduled to begin early in 1941. The plant will cost about $2,000,000.

The new plant will employ about 300 men, exclusive of timber cutting crews and foresters, under normal operating conditions. Over 100 carloads of highly specialized felting and processing machinery will be required to put the plant in operation, it is said. The plant will have a production capacity of 65,000,000 square feet of insulation board products annually. The new plant site is located in the heart of 1,000,000 acres of Southern pine.

WASHINGTON

▸▸▸ TEN COMPANIES MANUFACTURING COMPOSITION BOARD are defendants in an anti-trust complaint filed by the Federal Trade Commission. The complaint is announced as a test the validity of the use of patents "to circumvent the anti-trust laws." The Masonite company, one of the defendants is the owner of the patents in question, and the other nine defendants, acting as agents, include the following companies: Celotex Corporation, Certain-teed Products Corporation, Johns-Manville Sales Corporation, Insulite Company, Flintkote Company, National Gypsum Company, Wood Conversion Company, Armstrong Cork Company, and Dant & Russell.

▸▸▸ THE MUCH DISCUSSED STREAM POLLUTION BILL has now reached a conference committee of the Senate and House of Representatives. The original House bill, supported by the paper industry, in its desire for a comprehensive study of the problem, was passed by the Senate, but with amendments proposed by those advocating rigid control of sources of water pollution. These amendments permit the continuance of present industrial operations, pending the outcome of a study of the problem, but declare the discharge of new sources of pollution, unless approved by the Division of Water Pollution Control to be a public nuisance. These amendments might act to prevent the establishment of new industrial plants.

◆

POWELL RIVER TO BUILD NEW LAB.

A thoroughly modern laboratory, both as to design and equipment, is now being erected by the Powell River Company Ltd., Powell River, B. C. The building is to be situated at a central point in the mill site and will house the various testing, experimental and research staffs connected with the expanding operations and the development of the Powell River Company's products.

The building will have two floors and will measure about 50 feet by 85 feet. It will be equipped with an efficient air conditioning and heating system and indirect lighting will be provided in all rooms. In addition, constant temperature water and constant humidity equipment will be installed to meet the requirements of routine test and experimental work. It is expected that the laboratory will be ready for occupancy by the beginning of May.

"Please get out of my boudoir"

SAYS THE MATRON ON PAGE 43 TO THE TAPIR ON PAGE 44

"I wish to go," replies the Tapir. "But, madam, I'm *show through* from the next page. Can't you get my situation?"

"I'll get you if you don't get out! *The very idea...*"

"Ah, that's it, madam. The idea is to talk with your paper manufacturer."

"This is past the talking stage," says the Matron, raising her mirror. "It's time for . . ."

"Krebs Pigments, certainly," the Tapir dodges. "Madam, you are so quick! Just tell him they take *show through* out of even the thinnest paper."

"It's bad luck to break a mirror," says she, deciding to lower her arm. "Will these Krebs Pigments wipe you out?"

"They're certainly clean. You'll get white, bright paper that prints sharp and clear on both sides."

"A lot of bother for just one Tapir," she sighs.

"Why, it's easy. Krebs helps with technical information. They've pigment colors for paper, too. Just *you* ask."

KREBS PIGMENT & COLOR CORP.

1007 Orange Street...Wilmington, Delaware

LABOR RELATIONS COLLEGE STARTED AT PARAFFINE COS.

What is claimed to be the largest Labor Relations College ever established was formally opened on March 14 at the Emeryville (California) plant of the Paraffine Companies, Inc. The college was officially opened by W. H. Lowe, president of Pabco.

The college, organized by a corporation, has a faculty composed of labor leaders, professors, industrialists, editors and representatives. Labor leaders and corporate heads have endorsed the school and a big series of talks and addresses have been planned. The student body is composed of union business agents, union shop representatives of factory employees and the factory supervisor's force. The object of the college is to continue Pabco's promotion of employee-union and management co-operation.

The college is under the general direction of Henry W. von Morpurgo, manager of the public and industrial relations departments. Howard C. Wells, personnel manager, is in charge of the classes.

◆

PAPER DUTIES ANALYZED BY A. G. GOLDSMITH

In a statement before the U. S. Senate Finance Committee on March 4, Alan G. Goldsmith, vice president of the Mead Corporation and of the National Paperboard Association, brought forth several pertinent points regarding the status of the paper and paperboard industry.

On behalf of the American paper and paperboard industry Mr. Goldsmith informed the committee that the Reciprocal Trade Agreement Program had resulted in the reduction of duties on over seventy grades of paper, comprising more than 75 per cent of the entire product of an industry whose output is valued at upward of one billion dollars per year, and in some cases the duty rates were below those of the 1913 Tariff Act, which was the lowest rate tariff in American history.

"It is not the intentions of the pulp, paper and paperboard industry to enter into a discussion or criticism of the tariff," Mr. Goldsmith said. "We do, however, feel that facts should be presented by citing past history and present trends which will show what the results of recent tariff developments have been and what may occur."

After pointing out that the only difference between the American pulp and paper industry and in competitive areas was the difference in wage scales and labor conditions, and that every country in the world had access to mechanical devices and chemical processes that are used in this country, Mr. Goldsmith analyzed the damaging results of the existing agreements upon such branches of the paper industry as the wrapping paper manufacturers in the southern pine and other regions, printing papers in the northern states and fine tissue papers in New England. He presented tables showing that American paper mill employees' average earnings are more than twice those in the foreign countries with the highest labor costs and showed that undue tariff reductions are a direct threat to American standards of living.

◆

ABITIBI URGES GOVT. TO END RECEIVERSHIP

At a joint meeting of members of all the Abitibi Power and Paper Company's protective committee, with the exception of the bondholders' protective committee, it was decided to send a deputation to the Ontario Government to urge that the latter take active steps to bring the company out of its eight-year receivership. The members approved a plan for reorganization which provides for alloting to bondholders, 50 per cent of their holdings in new first mortgage bonds, 50 per cent in new debentures with provision for payment of accrued interest through issuance of noncumulative preferred stock, thereby adequately protecting bondholders in their priorities.

The plan also provides for allotting a percentage of new common stock to bondholders, the remaining stock to be divided among preferred shareholders and common shareholders. Complete details of the plan were not released.

◆

WHITING DEVELOPS AIR MAIL PAPER

A new writing paper product, designed especially for air mail use, has been developed by the Whiting Paper Company, Holyoke, Massachusetts. The paper was put on the market a month ago and is receiving enthusiastic reception in the trade.

Called "Whiting Clipper Mail," the new paper is of fine 60-65 per cent bond texture and is so light that four four-page sheets can be enclosed in an envelope and sent for the regular six cent air mail stamp.

FINANCIAL

Paper company annual reports show clearly the prosperity which came to the industry through the increased sales in the last quarter of 1939, when the European war had such an effect on commodity buyers. With the first quarter of 1940 concluded, it appears that the speculative buying which marked the early days of the war has ended, and that the industry is on a reasonably sound production basis, with a material and continuing volume of orders in most grades.

A. P. W. PAPER COMPANY, INC.—Net earnings were $46,369, as against a loss of $17,017 for the preceding year.

AMERICAN WRITING PAPER CORPORATION—Net profit for 1939 was $238,749, as against a loss of $48,857 in 1938.

BADGER PAPER MILLS, INC.—Net profit in 1939 was $251,905, as against $255,145 during 1938.

BIRD AND SON, INC.—Net earnings for 1939 were $757,600, as against $376,470 for the preceding year.

CONTAINER CORPORATION—Earnings for 1939 were $1,448,900, compared with $29,470 during 1938. The most striking phase of this report is that while earnings in the first three quarters totaled only 36 cents per share, the earnings for the final quarter were $1.49.

CROWN ZELLERBACH CORPORATION—Net profit of $5,797,632 is reported for the nine months ending January 31, as against $3,484,383 for the similar period a year ago. A final dividend for the year ending April 30 of 50 cents per common share, has been declared, making the total payments for the year $1, as compared with 50 cents for the preceding year.

DIXIE-VORTEX COMPANY—Net profit for 1939 was $856,200, as against $734,998 in 1938.

EATON PAPER CORPORATION—Net profit was $51,473, as against $17,059 in 1938.

FLAMBEAU PAPER COMPANY—Net profit in 1939 was $112,059, as compared with $84,955 in 1938.

FORT ORANGE PAPER COMPANY—Net earnings for 1939 were $103,772.

ROBERT GAIR COMPANY—A net profit for 1939 of $97,556 is reported, but this is before deduction of capital losses of $741,418, due to sale of unprofitable and antiquated equipment. Net sales for the year were about 12 per cent in excess of those for 1938.

There are MILES OF SMILES
FOR USERS OF

TIMKEN
ALLOY STEEL TUBES

. . . Not just one mile or two miles or the minimum, but more "miles and smiles of satisfaction" among the engineers who have discovered the working, staying and serving stamina of Timken Alloy Steel Tubes.

If maximum service at minimum cost makes you smile, you'll enjoy Miles of Smiles with Timken tube installations.

Now that we've made the assertion, let us give the proof. At your request, one of our metallurgists will call.

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO
Steel and Tube Division

TIMKEN
SEAMLESS STEEL TUBES

Manufacturers of TIMKEN Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; TIMKEN Alloy Steels and Carbon and Alloy Seamless Tubing; and TIMKEN Rock Bits.

GAYLORD CONTAINER CORPORATION—Net profit for 1939 was $662,042, as compared with $869,070 in the preceding year.

P. H. GLATFELTER COMPANY—Net profit for 1939 was $195,558.81 as against $110,560.57 in 1938.

GREAT NORTHERN PAPER COMPANY—Net profit of $2,727,442 is reported for 1939, as compared with $2,168,809 in 1938.

HINDE AND DAUCH PAPER COMPANY—Earnings for 1939 were $862,384, as against $645,778 in 1938. Bonds of a subsidiary, due in 1941, have been called for payment, amounting to $490,000.

HOBERG PAPER COMPANY—Earnings for 1939 were $187,500 as against $66,000 in 1938.

INTERNATIONAL PAPER AND POWER COMPANY—A dividend of $1.25 per share has been authorized on the 5 per cent cumulative preferred stock, leaving an unpaid accumulation of $12.50 per share, the last dividend previously having been in 1937.

KIMBERLY-CLARK CORPORATION—Net income of $2,053,585 for the common stock is reported for the year 1939, the highest net since 1930. Earnings for the year were at the rate of $4.21 per common share, as compared with $2.66 in 1938. Financing plans involving a bond issue of $20,000,000 have been announced. Of the proceeds, nearly half will be used for the redemption of outstanding 4¼ per cent bonds. The new issue will bear materially lower interest rates than the outstanding securities, ranging from 1½ per cent on early maturities to 3¼ per cent on the most distant maturities. Of the authorized issue, only $12,000,000 will be issued at this time.

MEAD CORPORATION—Formal notice has been issued of a $6,000,000 bond issue carrying 4½ per cent interest. The company's present outstanding bonds are at a materially higher rate of interest.

NASHUA GUMMED AND COATED PAPER COMPANY—Net profit for 1939 was $346,866, as against $194,804 in 1938.

NATIONAL CONTAINER CORPORATION—Net profit for 1939 was $357,945, as against $125,903 in 1938.

PUGET SOUND PULP AND PAPER COMPANY—Net profit for the first two months of this year were $161,690, as compared with $16,956 for the same period in 1938.

RAYONIER, INC.—Net income for nine months to January 31 was $1,425,193, as compared with $1,421,431 for the same period of the preceding year.

RHINELANDER PAPER COMPANY—Net earnings for 1939 were $272,456, as compared with $118,140 for the preceding year.

ST. CROIX PAPER COMPANY—Net profit for 1939 was $229,323, as against $135,230 in 1938.

ST. HELENS PULP AND PAPER COMPANY—Net profit for 1939 was $310,405, as against $316,970 in 1938.

ST. REGIS PAPER COMPANY—Earnings in 1939 were $547,819, as against a loss of $196,018 in 1938.

SORG PAPER COMPANY—Net profit for 1939 was $136,783, as compared with a loss of $289,317 in 1938.

UNION BAG AND PAPER CORPORATION—Net profit for 1939 was $965,532, as compared with $903,892 in 1938, but more than half of the year's total was accounted for in the last quarter of the year.

U. S. GYPSUM COMPANY—Net income for 1939 was $7,365,847, as compared with $4,725,497 in 1938.

S. D. WARREN COMPANY—Net earnings for 1939 were $465,916, as against $164,363 for the preceding year.

WEST VIRGINIA PULP AND PAPER COMPANY—Profit of $754,583 for the quarter ending January 31 is comparable to $389,164 for the same period a year ago.

New York Stock Exchange—Stocks

	Closing Prices March 25 1940	Feb. 24 1940
A. P. W. Paper Co...	*2½–2¾	*2⅝–3
Celotex	10⅜	10⅜
Same Preferred	66	66¾
Certain-teed	6¾	7
Same Preferred	30¼	32⅜
Champion P. & F. Co.	21	22
Same Preferred	103	105¼
Container Corp.	15	16⅛
Cont. Diamond	7⅛	7⅛
Crown Zellerbach	15⅝	16⅜
Same Preferred	90	90
Dixie Vortex	*13–13⅜	12¾
Same "A"	*36¼–37	35⅝
Flintkote	19¼	19¾
Robert Gair	3	3⅜
Same Preferred	12½	14
Gaylord Container	11⅜	.....
International P. & P.	11⅜	12¾
Same Preferred	53¾	57⅜
Kimberly-Clark	37¼	36¾
MacAndrews & Forbes	34	33⅝
Masonite	35¼	35½
Mead Corp.	9¼	10¼
Same 6% Preferred	*76–79	64
Paraffine Co.	42½	44
Same Preferred	*95–101½	.....
Rayonier	16⅜	17
Same Preferred	*27–27¾	28
Scott Paper	46⅜	47
Same Preferred	109	114
Sutherland Paper	30½	34½
Union Bag & Paper	12¼	13⅜
United Paperboard	4⅜	5¾
U. S. Gypsum	82	84¼
Same Preferred	*176–180	179½

New York Stock Exchange—Bonds

Celotex 4½%...	87⅜	87
Certain-teed 5½%...	79½	78⅛
Champ. P.&F. 4¾%..	104⅛	106½
Container Corp 5%...	101⅜	101¾
Inter. P. & P. 5%...	102	102¼
Same 6%	98	99
Mead Corp. 6%...	104½	103½

New York Curb Exchange—Stocks

Am. Boxboard...	5½	6
Brown Co. Pfd...	25	24½
Det. Paper Prod...	*¾–⅞	1
Great Northern...	42½	43
Hummel Ross...	5	4⅞
Nat. Container...	9½	10¼
St. Regis...	2⅜	2¾
Taggart	4⅜	5
United Wall Paper...	2⅛	2⅜

*Closing Bid and Asked Prices.

CUSTOMS NEWS

Though shipments have ceased because of the Finnish war, customs officials are witholding action on imports of Finnish printing paper which was above the normal weight of standard newsprint, had six per cent ash content and a gloss above that required by newspapers. The value is believed to be unduly low (the laid-down cost to the importer at New York being from $49 to $51 per ton) even with present high shipping rates. The paper was imported at New York, Los Angeles and San Francisco. The present Pacific coast laid-down price was about $4 per ton above that at New York because of added shipping cost.

The United States Customs Court has decided that paper in rolls shipped from Canada to a Puerto Rican newspaper is dutiable. The importer was unable to prove that paper in 15½-inch rolls was used chiefly by newspapers when the Tariff Act was passed in 1930. Domestic witnesses provided by the Import Committee testified that such paper was used chiefly for other purposes such as salesbooks.

Customs officials at Galveston are witholding action on imports of several hundred tons of paper of rotogravure type because of their belief that the selling price is below the ruling price of such paper in Norway.

. . . and controlled pneumatic loading is taking the place of levers and weights.

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CONTROLLED Pneumatic Loading has proved its effectiveness in the latest-type Puseyjones Machines as well as in the modernization of existing installations. It consists of an air cylinder self-contained in the press housing and operated in connection with the bell crank arm carrying the upper roll.

With Controlled Pneumatic Loading, a roll that is out of round can run smoothly without changing the nip pressure on the sheet every revolution. The life of the felt is increased, broke reduced, more effective drainage obtained and the quality of the sheet improved.

Special regulating devices connected to recording gauges provide independent control for each end of the roll with continuous record of nip pressure.

For new machines or for modernization of existing machines, write for full details on Puseyjones Pneumatic Loading.

View shows Puseyjones Pneumatic Loading System on main press of 234" Puseyjones Fourdrinier Machine at Southland Paper Mills, Lufkin (Herty), Texas.

THE SIGN OF TRADE MARK SUPERIOR QUALITY

THE PUSEY AND JONES CORPORATION

Established 1848. Builders of Paper-making Machinery. Wilmington, Del.

ADVERTISING PAGES REMOVED

LATEST PICTURES OF MOBILE PLANT

of Hollingsworth & Whitney

▶▶▶ One of this magazine's staff representatives writes that he passed this new plant a few days ago, and . . . but here's what he wrote: "the surroundings are very beautiful this time of year, with dogwood, yellow jasmine, etc. As I passed the plant I thought of you and used the last pictures in my camera to take these shots for you."

It's in Alabama

For the information of readers who have not followed the progress of this plant, it is being built by Hollingsworth & Whitney and is situated on the west bank of the Mobile River, about four miles north of the city.

If space permitted these three pictures could be placed end to end forming a panoramic view of the plant. Above—The pulp mill and bleaching unit.

At left and below—These two views illustrate the machine room and finishing room. Entrance to the mill is marked by clump of trees at right of the lower view.

Besides the 188-inch fourdrinier which is being built for the new mill it is understood that there will also be a 122-inch cylinder machine. The fourdrinier will trim about 164 inches, while the cylinder will trim about 112 inches.

The company's sulphate pulp production will include 100 tons of unbleached and another 100 tons of semi-bleached and bleached varieties. Production of the fourdrinier machine will be approximately 115 tons per 24 hours, while production of the cylinder machine will range from 50 to 60 tons per 24 hours.

The Rust Engineering Company, of Pittsburgh, are the contractors.

Editorial

FINNISH PULP INDUSTRY

▶▶▶ THE PRODUCTION OF mechanical, sulphite, and sulphate pulp for export is an important industry of Finland. According to figures published in the 1937 edition of The Finnish Timber and Paper Calendar, a total of 277,676 tons of groundwood, 757,637 tons of sulphite, and 323,238 tons of sulphate pulp were exported by Finnish mills during 1936. Although most of this pulp was shipped to European countries, particularly England, the United States was Finland's second largest customer.

In 1939, United States imports of mechanical and chemical pulp totaled 2,026,200 tons. Of this amount, Finland supplied 334,960 tons, or about 16 per cent, placing her in third position in so far as U. S. pulp imports are concerned. Only Sweden and Canada, in the order given, exported more pulp to this country during 1939.

Perhaps the importance of the United States as a market for Finnish pulp can be comprehended more fully by a study of the accompanying tabulation. This tabulation shows the annual pulp imports into the United States in tons and by kinds, beginning with 1920 and ending with figures for 1939.

U. S. IMPORTS OF PULP FROM FINLAND (In Tons)
(Compiled from data of the Bureau of Foreign and Domestic Commerce)

Year	Mechanical	Sulphite		Sulphate	
		Unbleached	Bleached	Unbleached	Bleached
1920	12,800	15,100	6,000	5,100	3,600
1921	.....	27,700	8,500	6,500	.....
1922	5,000	31,000	6,000	21,200	5,300
1923	9,300	65,600	13,500	16,400	6,100
1924	7,400	53,800	7,800	14,900	5,000
1925	4,300	54,900	4,600	18,500	5,500
1926	1,800	69,200	3,100	24,800	3,200
1927	5,500	78,500	5,200	15,800	6,200
1928	12,600	103,900	1,700	32,300	3,700
1929	10,200	122,200	8,200	30,400	5,400
1930	14,500	111,800	7,900	37,500	2,400
1931	12,500	109,200	10,000	60,100	2,300
1932	18,600	108,000	13,300	49,400	1,700
1933	22,500	133,600	22,800	52,700	2,500
1934	9,800	126,100	22,500	55,600	3,100
1935	24,500	146,200	29,600	62,200	4,100
1936	29,700	157,300	31,100	87,400	5,400
1937	17,522	123,112	47,433	88,764	9,163
1938	16,872	117,167	53,201	68,922	2,601
1939	20,148	115,404	70,101	121,149	8,158

This prologue has been given as background for consideration of the situation brought about by the recent territorial demands of the U.S.S.R. in terminating her war with Finland. The territory involved includes a number of pulp mills; but the actual loss of Finnish pulp capacity cannot be determined definitely until formal ratification of the peace treaty. Preliminary advice from the Department of Commerce, Washington, D. C., on this point has been cited in a release by the American Paper and Pulp Association. This release credits the territory with 13 pulp mills which have a combined annual pulp capacity of 392,000 tons, about 19 per cent of Finland's total pulp capacity. Expressed in another way, according to the same source, the territory includes about 27 per cent of Finland's sulphite capacity, 22 per cent of her sulphate capacity, and 4 per cent of her groundwood capacity (See Page 10).

Just what the outcome of this reduced pulp capacity of Finland may mean in World Trade, and more specifically in pulp exports to the United States, cannot be foreseen at this time. Will Finland's remaining industry expand through the building of new mills and the extending of operations of existing plants to make up for its recent loss of capacity or will it content itself to carry on as best it can without further increase of operations?

Whatever the decision, our hats are off to Finland and her people.

STRONG BASIC CONDITIONS RULE PAPER INDUSTRY

THE PAPER INDUSTRY has been facing an anomalous temporary situation market wise for the past three months.

In face of a growing shortage in wood pulp supplies, the paper market turned soft and irregular. The explanation is simple.

For the first three months of this year, general business took a precipitate nose drive to the extent of 25 per cent. Examination of the records for decades back shows no parallel. With so sudden a contraction of business volume, a slowdown in the depletion of inventories resulted. Consumers, merchants and converters had plenty of hold-over stock on hand—only sporadic buying appeared and was consummated only after the prospective orders had gone the rounds of seller mills. The mill which quoted the lowest price got the order.

In spite of this condition, the general market has held remarkably firm, for the mill reports for the first three months business shows volume equal to that of 1938 for the same period and the average prices per ton a bit higher. The time has now come when the decline in business volume has leveled off and an upturn is in the making. As soon as that upturn in volume is felt, the softness and irregularity in the paper market will disappear and be superseded by a vigorous demand for paper products.

The general run of consumers and buyers of paper are as yet unaware that of all the major industries in America, the paper industry is the most drastically affected by the war. For of the world's total production of wood pulp in 1937 (26,700,000 tons) almost one-half of it (12,000,000 tons), or 46 per cent, originates in the Baltic Basin. Outside that area, the only other pulp producing factors in the world are the United States and Canada.

The war, the invasion of Finland, the tight blockade of the Baltic Sea and now, the ruthless sinking and destroying of all neutral shipping from or to the Baltic area, all happening concurrently within the past seven months, the paper industry of the world is facing a vital complicated problem for its raw material—pulp supplies—which is becoming more of an alarming problem every day the war continues.

What is the domestic paper and pulp picture? In 1939, we consumed 15,878,379 tons of paper products—a new all-time high record. We must have pulp to make paper products. The United States produced 7,106,000 tons of pulp in 1939. It imported 2,026,000 tons (of which 1,285,100 tons came from the Baltic Basin, and 641,100 tons from Canada), 2,615,129 tons of newsprint, which came mostly from Canada, and 87,829 tons which came in from all other countries.

With the imports of pulp and paper aggregating 4,728,000 tons, all of which we must have from abroad, any interruption in the supply of that huge tonnage means a headache problem to our domestic producers and consumers alike.

At any rate, the paper industry is facing a critical climax right now.

ADVERTISING PAGES REMOVED

CURRENT THOUGHT

THE NEW CROP

WILLIAM SIBLEY

▶▶▶ IN SIXTY DAYS OR SO our high schools and colleges will turn out approximately two million graduates. Something like 600,000 of these will be added to the labor reservoir of the country. The problem of absorbing the annual crop of newcomers long has been a major concern, but during the past ten years it has been especially acute. Unfortunately, the graduates know this, and so must enter upon their task of finding a niche in our economic system under the mental handicap of fear. Each graduate probably knows many friends (from one to six years older than he) who have had extremely hard sledding to get a toe hold on the ladder of some going commercial organization. Some, he knows, have failed utterly—they becoming members either of some CCC camp, or of that shifting, restless band of "unemployed." It isn't to be wondered this picture scares him, but it should be remembered that fear, in whatever form or however justified, is a damaging, undermining influence which, by itself, makes the going the harder. We, in industry, who will be called upon to contact some of these graduates (officially or unofficially) might well bear this in mind and help our young friends by at least attempting to discharge their fears with encouragement. Sympathy for an unfortunate plight is a grand thing under given circumstances but with "the new crop" expressed sympathy will only deepen their fear.

Here is a second thought regarding the June graduate-job-seeker. How well the word "commencement" is assigned! The boys have finished school and have gone through "commencement" exercises. Okay! Both the years of schooling and their closing ceremonies are only the means of bringing the boy to his true "commencement." With the close of his scholastic training he becomes entitled to commence his commercial education. And he'll never be through with it. Upon graduation his education starts. He may be twenty or he may be twenty-four. Now that he has finished school he finds himself on Life Boulevard, standing either at 20th or 24th Streets, headed south. Where he will be, economically speaking, when he trudges along the boulveard to 60th or 70th Streets, depends entirely upon how well he learns and assimilates his economic education. If he is observing enough to remember the buildings and object-lessons he passes; if he remembers, from year to year, how best to cross the next annual street; if he sees the effect of booze on some of his traveling companions who stop along the way to "have a drink"; if he enjoys the accomplisment of climbing a hill even better than the vacation periods of coasting; he'll get along okay.

Schooling ends at 20th or 24th Streets. Education begins at that point —and never ends.

I know it is a big order to ask a young lad what he wants to do in life; that what he wants to be when he is fifty. The majority don't know. A few do. *All* should be encouraged to decide, soon. In the 40- or 50-year trudge along Life Boulevard it helps mightily if we know where we are going. What does the chap want to be, ultimately? A sales manager of a large firm; the president of an advertising agency; the general passenger agent of a railroad; the chief chemist of a large paper mill; an architect; the publisher of a newspaper or magazine; the manager of a large hotel—or, just *what* would he like most to be? In business an objective is a first requirement. It should be in the young lad just starting in business. If he *does* have the prime requisite of an objective, coupled with guts, intelligence (horse sense), the ability for hard work, a good personality, a sympathetic understanding for the problems of others, and a constructive imagination his ultimate attainment is assured.

Suppose the young man wants to be the president of a profitable advertising agency when he is fifty or fifty-five. What should he do first? Well, it wouldn't hurt if he investigated the biography of fifteen successful agency presidents. Analyzing those fifteen biographies he would doubtless find several common elements of business education. Probably the majority of them started in life as a newspaper reporter. From there, the majority probably got into advertising via "assistant advertising manager" for a small industrial concern, or perhaps getting on the sales staff of the newspaper's advertising department. He would doubtless find that all of them knew the value of wide contacts. He would find in them a common liking for the study of markets and merchandising. He would doubtless find other personal and educational elements largely common to the entire group of fifteen.

With that pattern of the composite president before him it would be relatively easy to chart his business course. His first step would be to get a job as a newspaper reporter. Regardless of how or where—get on the reporting staff of a newspaper. And not only work at that job two or three years, but lick it by doing it well. Then, at the end of three years, (he's down to 27th Street, now) get a job selling advertising space, or being an assistant advertising manager. Lick that job in two, three or four years. From there, get a better advertising job—perhaps the advertising managership of a larger firm. Stay there, and lick that job until he can move on to the next educational necessity—perhaps at 36th Street. In the meantime, he will have learned of the distribution setups in several industries; he will have studied markets; he will have done several of the things which will now fit him to become a copywriter, contact man, or new-business man, in some good agency. Now, he has his toe hold in the place he wants to be, and whether or not he ever makes the presidency, is of relatively small importance. He is on his way; he has been for several years, and he will continue to be.

Let us tell the young men of today that it is no harder for them to get a job than it is for many of us older men to keep our jobs. Let us assure them of the simple fact that the only difference between him, the graduate, and him the president, chemist, or what-not, is Experience. The boy has just as many brains, just as much personality, just as much enthusiasm, energy, ambition, good looks, and basic schooling, as the man in the place he covets. Both men, the youngster and the oldseter, have only two legs, two eyes, two ears, two arms. There is virtually no difference between the two —except Experience.

If the young lad will analyze a composite of the man he would like to replace when he gets to be fifty—and sets a course of Life Study to gain the necessary and now missing Experience —he'll get there.

The young men of today will be the business executives of tomorrow. Let's help them in every possible way.

Humidity Standards for Paper Testing

M. S. KANTROWITZ[1] and ERNEST W. SPENCER[2]

▶▶▶ FOR NEARLY TWENTY YEARS varying opinions concerning the proper temperature and relative humidity conditions most appropriate for testing printing paper and other paper products have been expressed in this country. During this time many arguments for one standard or another have been advanced, but few of the contentions have been based upon firm, logical foundations. The present TAPPI standard of 65 per cent relative humidity seems to have had its origin in the textile industry of England. It is an interesting fact that textile weaving, particularly wool weaving, is facilitated by atmospheric moisture of 60 to 75 per cent relative humidity.

HISTORICAL BACKGROUND

Dr. J. Merritt Mathews, consulting chemist for the Textile Industries of England, in his textbook on *The Textile Fibers*, states that ". . . In general, for spinning operations 60 to 75 per cent relative humidity gives the most satisfactory results."

As a corollary of this fact it is to be noted that, in England, the annual mean for outdoor relative humidity, indicated by official weather reports, lies between 65 and 75 per cent, and this condition also exists throughout the greater part of Continental Europe.

In London the reports for two successive years show average monthly variations of 50 to 88 per cent, the annual average of these monthly averages being 64 per cent. It has been noted that, as a probable consequence of the nature of European heating facilities, the indoor relative humidity is in general higher than in the United States, and this is true of unconditional printing plants also.

It is, therefore, natural that in England and elsewhere in Europe, the materials entering into the manufacture of woven fabrics should be tested for their physical properties of strength and endurance, which determine their service ability under humidity conditions as nearly as possible, representing those which occur in the actual use of these materials in the industry. To a large extent, therefore, such test results would predict the quality of performance of the materials under use conditions.

The textile industry in America adopted, as its standard, this European custom of testing at 65 per cent relative humidity. The earliest type of air-conditioning equipment, which was not fully designed for dehumidification, was, therefore, conveniently adapted to maintaining a relative humidity of 65 per cent.

Briefly, these were the reasons for the textile industries in Europe and in America adopting a testing standard of 65 per cent relative humidity, and the fact is emphasized that this relative humidity represents a most desirable condition under which textile products may be spun and woven.

For precisely similar reasons the United States Government Printing Office adopted a relative humidity of 50 per cent for testing paper. A survey of atmospheric conditions has shown that, although throughout the United States the average annual outdoor relative humidity closely approximates 65 per cent, the average indoor relative humidity is not, throughout the seasons, usually greater than 50 per cent, and, during the winter months, it is often much less.

A canvass of some of the largest printing plants in the United States revealed a preferential relative humidity of 50 per cent and temperature of 70-75 deg. Fahr. as the optimum conditions for all printing operations.

L. F. Ross, of the Parks-Cramer Company (manufacturer of air conditioning equipment), states: "Some testing laboratories make tests on both paper and textiles. In such cases, of course, a fixed common test condition is of desired convenience, but we do not feel that there are enough such laboratories to make this a very great problem. I think we can agree that the advantages of a 50 per cent relative humidity standard for the paper industry outweigh any possible disadvantages. . . . Almost without exception printing plants or other paper processing companies which have installed humidifying or air-conditioning equipment operate at a relative humidity within a 45 to 55 per cent range. Most of the paper mills which have made any serious attempt to control the moisture content of their finished papers plan to have it leave the mills with a regain corresponding to approximately 50 per cent relative humidity.

"We have heard expressions from a good many men in the paper industry indicating that they would approve a standard of 50 per cent as this would more nearly meet the conditions under which the product is used than the higher relative humidity of 65 per cent. Most printing plants which have any conditioning equipment try to maintain a relative humidity of about 50 per cent. Naturally this varies slightly in different plants, one desiring perhaps 48 per cent and perhaps another setting 52 or 53 per cent as his standard.

"From the information available to us, almost all technical testing laboratories connected with the paper and printing industry have equipment which will permit them to maintain 65 per cent relative humidity in order to meet this more or less official standard, but have sufficient refrigerating capacity to permit them to maintain 50 per cent relative humidity and feel that this is a better standard for the paper industry.

"There is quite a tendency among paper mills and paper processing concerns to feel that a 50 per cent relative humidity is a better standard for them than 65 per cent. Probably if the 65 per cent standard had not been inherited from the textile industry, 50 per cent would have been used as the standard in the paper industry."

M. C. Cole, vice president, Southworth Machine Company (manufacturer of air conditioning equipment), has made the following interesting statement:

"In (printing) plants where they have a regular air-conditioning system which consists of humidification, ventilation and refrigeration, the writer has found they are maintaining 45 per cent to 50 per cent relative humidity."

B. L. Wehmhoff, of the West Virginia Pulp and Paper Company, stated at the 1938 annual TAPPI convention: "Relative humidity testing conditions apply not only to printing paper but to any kind of paper. Probably I will start something on the old 65 per cent business but I do not agree with it and never did, and the only place I will agree to change is on the 50 per cent condition. I would like to see you cut it to 40 because that comes nearer the

(1) Technical director, and (2) assistant technical director of the United States Government Printing Office.

conditions under which paper is used. No printing plant that has a conditioned testing room runs them at over 50 per cent, and many of them are run under that. Nearly all the conditioned pressrooms are held around 40 per cent relative humidity."

ECONOMY IN MAINTAINING STANDARDS

The statement, frequently made, that it is easier and more economical to maintain a relative humidity of 65 per cent than 50 per cent relative humidity, may have been predicated upon the early development of refrigerating apparatus, when dehumidification of the atmosphere presented a greater problem than it does today.

B. W. Scribner, of the National Bureau of Standards, at the 1938 annual meeting of TAPPI said: ". . . A survey was made a few years ago and at that time a slight majority was in favor of retaining the 65 per cent relative humidity. Conditions have changed, however, in the past few years. I think 65 per cent relative humidity was adopted simply because the textile industry used it. Furthermore, that condition is easier to maintain without complete air conditioning systems than the lower relative humidity. But with the present inexpensive air-conditioning equipment we have now, there is no reason why a laboratory cannot maintain 50 per cent relative humidity and, of course, it is a fact that most paper is probably used—printing paper at least—at that relative humidity. So that question will come up pretty soon for the industry to determine just what they want."

Various manufacturers of air-conditioning equipment have been consulted to obtain reliable information in regard to the facility and economy of maintaining certain standard moisture conditions.

Among the replies was this from L. F. Ross, of the Parks-Cramer Company: "Prior to the development of dependable, relatively inexpensive refrigeration equipment during the past few years, it certainly was easier and more economical to maintain a relative humidity of 65 per cent in a laboratory than a relative humidity of 50 per cent. . . . Recent developments in comparatively small refrigeration condensing equipment within the last 10 or 15 years have made it more practical and less expensive to maintain a laboratory at 50 per cent relative humidity than was formerly the case. . . . Most laboratories today which attempt to be at all scientific have installed complete air-conditioning equipment with refrigeration so that the same temperature and the same relative humidity can be maintained within the laboratory throughout the year and regardless of outside weather conditions. These modern laboratories are well insulated and under these conditions the difference in the first cost and operating cost between equipment to maintain 65 per cent and equipment to maintain 50 per cent is comparatively slight."

EFFECTIVENESS OF HUMIDITY CONTROL IN PRINTING

The difficulties experienced in the use of paper under variable atmospheric conditions occur principally in printing plants where great losses in time and production are caused by the development of static electricity, resulting from frictional effects under printing operations at a low relative humidity and temperature, paper curl due to high moisture, and dimensional variations due to variable moisture and temperature.

The quantity of moisture in the air at a relative humidity of 50 per cent is sufficiently high to avoid the development of static electric charges on the paper in process of printing or folding, and sufficiently low to avoid curling edges, misregistration and other troubles commonly incident to very humid atmospheres at the time of printing.

Robert F. Reed, research director of the Lithographic Technical Foundation, writes: "The experience gained by lithographers has indicated definitely that 65 per cent relative humidity is too high, and all well informed lithographers are now convinced that the lowest possible relative humidity consistent with the absence of static electricity and tendency of the paper to curl is the one that should be maintained."

LOGICAL STANDARDS

It is logical to test papers under the conditions which will best indicate their normal working properties, rather than to select, as standard conditions, arbitrary ones which appear venerable merely because of long continued use.

In this connection, E. O. Reed, technical director of Crane and Company, recently stated: "Physical tests in general such as gloss, porosity, oil absorption, bursting strength, tensile strength, and especially folding endurance should be made under conditions which are in harmony with the conditions under which the paper will be used.

"Laboratory tests performed for the control of paper manufacture with respect to moisture content, and hence weight, thickness, gloss and smoothness at 65 per cent relative humidity do not represent the actual condition of the paper at the delivery end of the paper machine where the paper contains from 3 to 4 per cent less moisture than it would if in equilibrium with the atmosphere at that relative humidity.

"Laboratory test results, to be informative to the paper user, must check as nearly as possible with the results obtained in the mill at the delivery end of the paper machine. It is impossible to co-ordinate mill production with technical control if the relative humidity conditions during testing give the paper a higher or different moisture content."

RELATIVE HUMIDITY EFFECTS ON PHYSICAL PROPERTIES

Weight

Most paper, with the possible exception of newsprint, comes off the machine with a moisture content of 4 to 5 per cent of its weight and this amount is in close equilibrium with an atmospheric condition of 50 per cent relative humidity and 70 deg. Fahr. At 65 per cent relative humidity and the same temperature the paper contains 7 to 8 per cent moisture by weight.

Paper is bought and sold on the basis of weight. Therefore paper should be tested at a relative humidity having an atmospheric moisture content corresponding as nearly as possible to the moisture content of the paper. W. B. Campbell, technical advisor of the Forest Products Laboratories of Canada, stated at the 1938 annual TAPPI convention: "Conditioning the paper at 65 per cent relative humidity may also change the weight beyond the amount of tolerance allowed by trade custom so that a shipment readily within the specified weight may be unjustly condemned by the literal application of such testing rules."

Folding Endurance

Published data show that considerable time can be saved by testing paper for folding endurance at 50 per cent relative humidity. E. O. Reed found marked increases occur in the folding endurance of rag content book, bond and ledger papers as the humidity increases. The increase in the number of folds between 45 and 65 per cent relative humidity varied from 40 to 253 per cent in the machine direction and from 0 to 104 per cent in the across-machine direction. Kraft, rope and unbleached sulphite wrapping papers also showed marked increase in folding endurance at 65 per cent over the results of 45 per cent, the results increasing in the machine direction 276 per cent for kraft,

334 per cent for rope and 749 per cent for unbleached sulphite, and in the across-machine direction 135 per cent for kraft, 66 per cent for rope, and 330 per cent for unbleached sulphite.

M. D. Bardeen, president, Lee Paper Company, Vicksburg, Michigan, speaking at the annual meeting of the American Pulp and Paper Mill Superintendents' Association in 1931 stated: "The fold test is the most susceptible to small changes in temperature and relative humidity but tear and Mullen and other tests are affected to an appreciable degree. The fact that the folding endurance test is being generally recognized as one of the most significant physical tests for high grade paper is demanding uniform testing conditions.

"The lack of general information concerning the variation in results of physical tests under varying conditions of temperature and relative humidity leads to considerable confusion among salesmen and purchasers through the quotation of extremely high tests, particularly folding tests, by salesmen for their sheets without specifying the temperature and relative humidity at which these tests were made. If your sheet has been tested at say 50 per cent and showed a fold of 350 double folds, it is perfectly possible for a salesman with a sheet of approximately the same or slightly lower actual grade to shave your price and at the same time claim a folding endurance of 500, as long as he is not forced to specify under what conditions the tests were made—which with a few exceptions he is not at the present time."

Smoothness

The Government Printing Office made a series of physical tests on the smoothness of paper surfaces at 50 per cent relative humidity and 70 deg. Fahr., and later the same samples were conditioned and tested at 65 per cent relative humidity and 70 deg. Fahr. The results obtained at 65 per cent relative humidity were approximately 10 per cent lower than those made at 50 per cent relative humidity.

H. W. Johnston, of the Forest Products Laboratories of Canada, in the course of a TAPPI discussion on this subject said: "I think it is perhaps rather unfortunate that 65 per cent relative humidity was chosen rather arbitrarily some years ago . . . it is inconvenient in the writing industry and also inconvenient in the printing business, because it represents a humidity which it would not be practical to maintain without destroying the finish of the paper. You will probably run into other difficulties, also in the nature of changes of dimensions if you get your paper too moist."

Expansion and Contraction from Moisture

In a research program on register of paper in offset lithography by the National Bureau of Standards in co-operation with the Lithographic Technical Foundation, a study was made of elongation of various samples of lithographic papers under tension. Samples were conditioned and tested in atmospheres of 30, 45, 65, and 75 per cent relative humidity. The following statement was made in Research Paper No. 480 of the National Bureau of Standards which discusses the results of this study: "The minimum variation between the expansion of the different papers occurred at 45 per cent relative humidity and changes in expansion for changes in relative humidity were of smaller magnitude in the vicinity of 45 per cent relative humidity than at other humidities used. These results indicate definite advantages in the selection of an atmosphere of approximately 45 per cent relative humidity for lithographic plants."

STORAGE CONDITIONS

In Miscellaneous Publications Nos. 144 and 154 which constitute reports of a study by the National Bureau of Standards on storage conditions relative to the preservation of records in libraries, A. E. Kimberly and B. W. Scribner made this statement about conditions to be maintained in the National Archives Building in Washington: "It is planned to maintain a relative humidity of 55 per cent in the storage spaces and of 45 per cent in work rooms. The latter condition is the better adapted to human beings. The temperature throughout will be kept at 70 deg. Fahr. during the winter and 80 deg. Fahr. during the summer. . . . The temperature and relative humidity recommended were chosen because they represent a range in which the substances stored exhibit good strength and flexibility."

TAPPI SURVEY

In 1932, TAPPI made a survey in regard to the relative humidity being used by paper manufacturers' laboratories, consumers' testing laboratories and commercial testing laboratories and the results were published in TAPPI Special Report No. 171. In this report the following were characteristic reasons given by the 50 who replied to the question as to what relative humidity they employed and why. Most of those who were conditioning at 65 per cent relative humidity stated that they were doing so because: "It is the custom," or "It is the TAPPI adopted standard," or "It is the textile industries' adopted standard," or "Most people use it," or "It seems satisfactory for the small amount of paper tested." One reply even stated that they used 65 per cent relative humidity with the hope that the entire building in which they were located might some day be air conditioned at 65 per cent relative humidity and they would then be right in line. Almost none of those using the 65 per cent standard had a factual reason for doing so, but many of those choosing 50 per cent as the testing standard presented logical reasons in support of their contentions.

WHO SHOULD ESTABLISH STANDARDS FOR PAPER TESTING?

The adoption of 65 per cent relative humidity has been advocated because it was the standard adopted by several European countries.

When we consider that nearly one-half the paper manufactured in the world is produced by the paper industry of the United States (according to a report issued by Charles W. Boyce while he was executive secretary of the American Paper and Pulp Association), it is quite as fitting that the European countries should follow the example of the United States in adopting testing conditions as that we should follow their practice.

WHAT IS THE OBSTACLE TO CHANGING STANDARDS?

It is sometimes contended that much data accumulated during the past 30 years would be sacrificed by changing the present testing conditions.

This contention is somewhat tempered by the fact that recently-developed instruments for greater precision of measurement and improved methods of technique already have rendered the older data somewhat obsolete and worthless as a contribution to progressive science. Inquiry might be made here as to what has been the nature of the data accumulated over so long a period of time. Are these data now being correlated and studied with a view to drawing any conclusions useful to the paper industry? E. Sutermeister, of the S. D. Warren Paper Company, writes: "In connection with the contention that much of the accumulated data will be sacrificed by changing testing conditions, I would like to make the comment that this argument is valid for only a relatively short period. As a matter of fact most of the data over ten years of age are obsolete anyway because of changing conditions in the industry and increased

knowledge of the subjects. We usually find, when attempting to interpret old data in the light of recent advances, that lack of full statements regarding conditions of testing make it impossible to use them. I feel that this argument should have little weight."

WHO NOW USES 50 PER CENT RELATIVE HUMIDITY FOR TESTING PAPER?

Most fine paper manufacturers use 50 per cent relative humidity. Certain mills which formerly tested their papers at 65 per cent relative humidity have now changed to 50 per cent. Some technical men of the paper industry who formerly advocated 65 per cent now favor 50 per cent relative humidity. There is, therefore, considerable evidence that a large portion of the paper industry itself is not satisfied with the present TAPPI testing standard.

The Joint Committee on Printing of Congress in December, 1923, adopted 50 per cent relative humidity as being most nearly representative of the conditions in this country under which paper is used. The Federal Specification Board in January, 1925, adopted 50 per cent relative humidity. Therefore for the past 15 years the specifications for all paper purchased by the United States Government have required tests to be made at 50 per cent relative humidity.

The E. I. du Pont de Nemours & Company's technical laboratories for paints and varnishes in Philadelphia chose 50 per cent relative humidity on the ground that this condition represents an excellent average of indoor winter and summer conditions throughout the United States.

The American Chemical Society recently adopted 50 per cent relative humidity for testing the papers, wrappers and envelopes used for that Society's publications.

In June, 1938, a committee of nationwide representation composed of textbook publishers, textbook manufacturers and state boards of education recommended to the States for adoption a standard of 50 per cent relative humidity plus or minus 2 per cent, for the testing of book and end papers. There is already a movement on the part of certain states of the Union to adopt Federal specification standards of 50 per cent relative humidity and 70 deg. Fahr. temperature for testing the paper used in printing state school text books.

Certainly the present and the future of the paper industry should be considered rather than the past when establishing definite standards for all time to come. Thoughtful consideration becomes especially important, when establishing technical standards, in the light of the fact that there is a definite trend at present in the graphic arts and allied industries toward controlled conditions of 50 per cent relative humidity. Establishment of standards not in accord with this would soon prove to be out of step with progressive developments.

In conclusion it may be said that standards traditionally and conservatively preserved by the textile industry are not best suited to the paper and printing industries. Paper testing, whether for fundamental research, for mill control, or for the consumer is primarily for the purpose of determining the suitability of paper for its industrial uses.

In the light of the foregoing facts it is therefore submitted that the paper and printing industries should establish testing standards most logically and practically suitable to indicating the performance properties of the materials they consume in production.

The Government Printing Office has for the past 18 years tested paper and paper products, purchased for the public printing and binding, under atmospheric conditions of 50 per cent relative humidity and temperature of 70 deg. Fahr.

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MAKING ANTIFRICTION BEARINGS LONG-LIVED

W. F. SCHAPHORST, M.E.

▶▶▶ IMPROPER INSTALLATION and care are two reasons why ball and roller bearings commonly fail prematurely. When installing it is just as important to protect the bearings against dirt and grit as it is to properly attend to all of the mechanical details of alignment, housing, and oiling.

Many installers of antifriction bearings seem to think nothing of the extreme care with which the manufacturers cover the bearings with rust preventive, wrap them, and seal them, so that dust, grit, and moisture cannot get in.

When installing antifriction bearings, an excellent method is to thoroughly clean the housing in which the bearing is to be installed. Blow with compressed air, if available. Wash with gasoline. Wipe clean with new wrapping paper. New paper is preferred to rags or cloth because paper does not leave lint and is not likely to make the surfaces dirtier because the paper is *new*. The objection to rags is that they are commonly used until they themselves become seriously dirty. Care exercised in keeping dust and dirt out of the bearing is paid for over and over in longer bearing life.

Smoothness of bearing surface is of supreme importance. Just as soon as the surface becomes the least bit rough it ceases to operate silently and smoothly and its coefficient of friction increases. Expose an unprotected highly polished surface to the atmosphere and it is likely to pit in a surprisingly short time. Yet spare bearings are sometimes exposed to the atmosphere, steam, and corrosive gases—bearings which may not be put into use for months or years. Wrappings are sometimes carelessly removed and the protecting layer of rust preventive is rubbed off in spots. As a result, even before the bearing goes into service, it is ruined.

After the bearing is installed, lubrication is most important. Never use a lubricant that has graphite in it. The fact that it is a solid, graphite has ruined many a ball bearing. Use a lubricant that does not vaporize easily, otherwise if the bearing is not used for some time the lubricant will evaporate from the balls and surfaces not immersed in the oil, exposing the surfaces to the atmosphere, moisture, and gases, and pitting will be the inevitable result. Properly designed bearings seldom require re-oiling and for that reason as well as for the protection of the bearing it pays to use a high grade lubricant. Never use an animal or vegetable oil on antifriction bearings. Such oils commonly break down and form acids and alkalis. Use only the purest mineral oil.

Finally, and briefly: (1) use antifriction bearings of correct size; (2) use the correct type; (3) install them correctly; (4) use a high grade mineral lubricant; (5) take good care of the bearings; and (6) be sure that your spare bearings are generously covered with a good rust preventive, wrapped and sealed.

TRAINING *for Better Jobs*

G. W. PHILLIPS
Director of Safety and Welfare
The Champion Paper and Fibre Company (Canton Div.)

▸▸▸ MORE THAN TWENTY YEARS AGO, Reuben B. Robertson, president of The Champion Fibre Company, Canton, North Carolina, conceived the idea of vocational training for Champion employees, and in August 1920, the first training school was organized in the Canton Division of The Champion Paper and Fiber Company. The venture seemed to offer such profitable returns to untrained employees that the vocational training program, under the supervision of the North Carolina State Board for Vocational Education, has become a permanent institution in the Champion organization. As a result, hundreds of employees have been trained for better jobs, and have been promoted to more profitable positions.

In January, 1931, an apprentice class was added to the vocational curriculum. At the present time twenty-four subjects are covered, including: millwright practice, blueprint reading, practical electricity, shop mathematics, welding, shop metal work, sheet metal work, woodwork, chemistry, waterworks practice, evaporation, smelter practice, caustic liquor making, pulp drying and handling, color and paper sizing, papermaking, rewinder processes, cutter operation, finishing, storage, apprentice, slide rule and salesmanship.

The instructors consist of foremen, engineers, chemists and skilled trade workers. All trainees attend the classes voluntarily and all classes meet after work hours and on their own time, with the exception of the mechanical apprentices, who attend class during their regular work hours.

The classes are held in the afternoon and evening, and are scheduled so far as possible, to suit the convenience of the trainees, who in most cases are on shift work.

The courses are fully outlined and each lesson is written up; and, in addition to the subject matter, all necessary sketches, drawings, etc., that will help to make the subject clear and understandable are filled in at the proper places. The instructors try to completely cover the subject and not just touch the high spots, which is so often the case in the lecture method. So far as possible, the instructors try to make each class a discussion group and the instructor acts as leader of the discussion rather than teacher.

The instructors, as well as the vocational director, A. A. Arthur, feel that by having the written subject matter the students are better able to keep up with lessons when they work on a shift that conflicts with their class schedule because the trainees can get the subject matter from the instructor and study the lesson before the next meeting. In most cases they contact their instructor in regard to any points they do not understand.

At the close of each school term the company gives a banquet in honor of those who receive certificates in its Vocational Educational School. Note tables form letters V E.

The courses are outlined in *units* and the length of a unit depends on the number of meetings being held in the fall and spring sessions. For example, if one process can be covered thoroughly in one session, meeting once a week, and the process is closely related to another process, it is Unit 1, and the related process is Unit 2. All processes are covered in this manner. Or, where a unit of a course requires one meeting a week in both the fall and spring sessions, this type unit may also be a short unit or the first unit in a subject that may take two, three or four years to complete, a unit being completed each year. Other units of a course may require two meetings each week in both the fall and spring sessions.

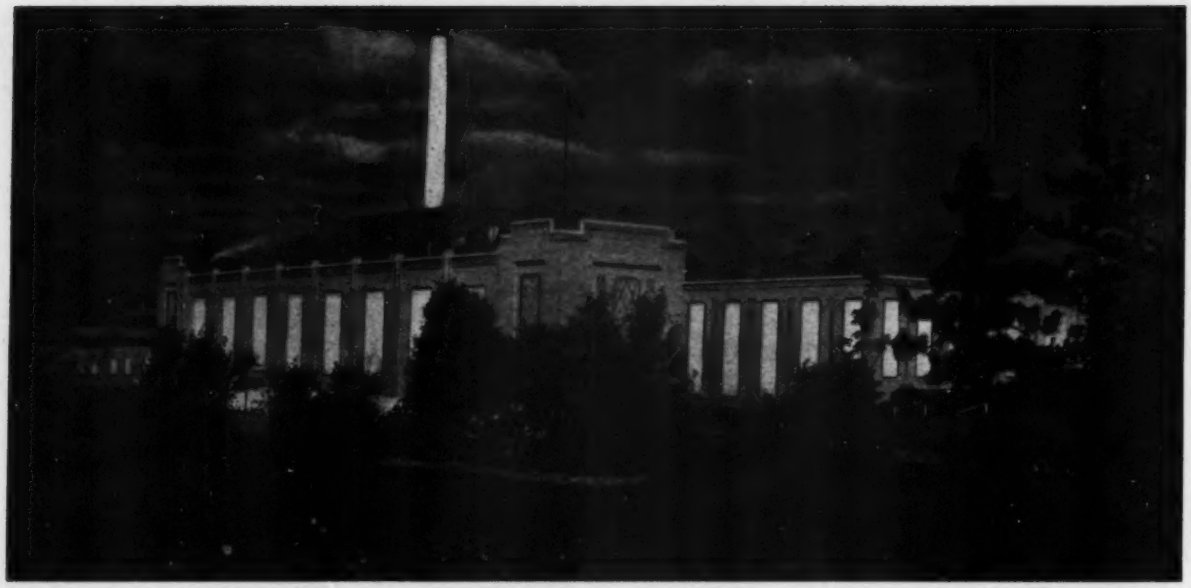
All trainees who attend seventy-five per cent of the classes in a session and who pass their work satisfactorily are awarded a certificate by the State Board for Vocational Education.

Individual records are kept of all trainees and a copy is passed on to the superintendent of the department in which the trainees are employed, so that when promotions are considered these records are available for consideration.

The 1938-39 session of the Canton Division of The Champion Paper and Fibre Company closed May 26, 1939, and, at the closing exercises held in the Champion Y. M. C. A., a banquet was given by the company to those who passed a satisfactory examination and received certificates. One hundred and ninety-three were awarded certificates by the North Carolina State Board of Vocational Education; the largest class was "salesmanship." There were 54 in the class and 29 received certificates.

During the past 19 years since vocational training was started in the Canton Division of The Champion Paper and Fibre Company, an average of approximately 125 employees per year have been trained, and as a result they are today receiving higher wages be-

(*Concluded on page* 48)



The mill as it appears today after having been rebuilt into the first windowless paper mill and the grounds landscaped.

LANDSCAPING

▸▸▸ TO WRITE THE STORY OF landscaping the Blandin Paper Company's mill property is almost tantamount to writing a portion of the life story of C. K. Blandin, the president and active head of the Company which bears his name. It was his vision, his planning and action that transformed what was "just another paper mill" into a landmark of beauty.

Late in 1916, when World War needs threatened a newsprint shortage, Mr. Blandin purchased the mill at Grand Rapids, Minnesota. It was then known as the Itasca Paper Company.

Mr. Blandin was then the publisher of the *St. Paul Dispatch* and the *St. Paul Pioneer Press,* and the mill was purchased for the purpose of protecting the newsprint requirements of these newspapers.

Publishing metropolitan daily newspapers in St. Paul wouldn't seem to leave much time for landscaping a mill property in Grand Rapids, but, nevertheless, some time was given and thoughts gradually evolved into plans.

Aside from the personal satisfaction Mr. Blandin finds in creative work, he has always believed that it is good business to make the mill and the grounds surrounding it attractive to the eye.

He wanted the suurroundings to be a pleasant greeting to us as we come to work, and a nappy recollection to take with us as we leave at the end of the day.

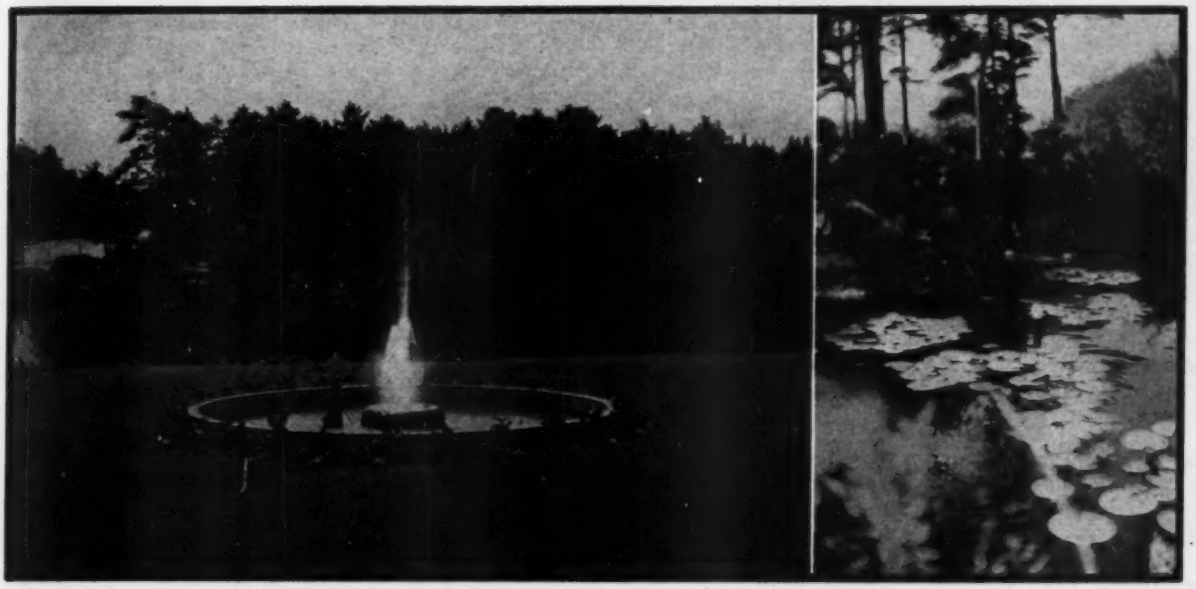
The customers who buy our paper have the satisfaction of knowing that the paper they buy from us is not only good paper, but that it was produced in a factory that is kept clean outside as well as inside.

To a community, a mill or factory can be an eyesore, or it can be a spot toward which the residents point with pride.

It so happens that the Blandin Paper Company is the largest industry in the Grand Rapids community. Because of its size and importance to the community, it must perforce take the lead in a number of ways. It should not be lacking in example of outward beauty.

C. H. SCHACKER, Secretary
The Blandin Paper Company

Site of the paper mill as it appeared about 1900.



Electrically-lighted fountain located on the east lawn between the mill and the main highway, and (at right) pool in Villa Park.

The Mill Property

Mr. Blandin takes the attitude that a mill should not be "merely tolerated" as a necessary evil. People living near the mill should enjoy having it in their community, but their enjoyment and appreciation must not flow entirely from the economic and financial benefits accruing to the community.

The actual work of landscaping was begun in 1917, and by the end of 1919 three houses owned by the company and located across the river from the mill had been completely landscaped. A start had also been made on what is called the Office Park. This is located directly north of the office and contains an area about the size of a small city block.

For reasons already indicated, progress in the beautification of the grounds during the early years was made slowly. In the latter part of 1927, Mr. Blandin sold the St. Paul Newspapers and the active development of the mill landscaping as it appears now really dates from that time. Plans were completed in 1928 and in the spring of 1929 work was begun on both sides of the river. On the residence side to the west, the Villa Park was laid out, and to the east, a distance of a quarter mile running along the river from the company houses to the main highway, lawn and shrubs, as well as trees, were planted. Walks and drives were built. The whole scheme was blended into the beauty that is natural to our North country.

The Villa Park, on the west of the company houses, adjoins and blends into the landscape surrounding the Blandin Villa. Here we installed underground pipe, and a pump brings water from the river lake to the highest point of the park. From there the water flows over a cascade into a pool, from where it empties into a little brook to wend its way slowly over its rocky bed under little bridges back to the Mississippi. A winding pathway leading through the park brings a pleasant surprise at each turn—a rustic little bridge, a gorgeous bed of flowers, a rare shrub, a clump of trees, or a shy little nest of flowers hidden among a profusion of shrubbery.

In the shadow of tall pine, on a base protruding from among the ferns, stands a replica of the Famous Fountain Manikin, the original of which has been in one of the parks of Brussels for over four hundred years.

The first mill building as it appeared when completed in 1902.

The pool is a beauty spot all by itself. It is hemmed by a profusion of fern, large boulders, small and large shrubs, as well as large pine trees. Its surface is adorned with water lilies of pink, white, and other colors. Gold fish make their home in its waters. These are of all sizes—some just come to life and others six inches long.

The exit to the street leads through wrought iron gates which are hung on rustic rock piers.

Across the street directly south of the Blandin Villa is a half acre flower garden. This is a wild profusion of rose arbors, gladioli, California poppies, larkspur, zinnias, bachelor buttons, and many, many others. A riot of color greets the eye and each seems to vie for the attention of the onlooker.

On the mill side of the river, further improvement was made on the "Office Park." Wide, sweeping steps were built which lead onto a plaza where a 75-foot pole flies the American flag. Additional flowers were planted, and shrubs and trees so placed as to screen out vacant lots and buildings not in harmony with the general scheme.

Another 1929 project was the beautification of the railroad station grounds. This was done by Mr. Blandin because the station is across the main highway from the mill property and by beautifying it, the visitor coming into Grand Rapids from the south is greeted with a harmonious picture.

In 1930, the mill building was rebuilt into the first windowless paper mill in the world. This necessitated tearing up the landscape adjacent to the mill.

The work of replacing the landscape was begun almost immediately upon completion of the new building. Plantings were planned to harmonize with the new exterior of the mill.

The largest single project was the development of the east or front lawn, which is located between the mill and the main highway and runs along the northern bank of the river. A wall was constructed along part of the river, and against this a little grove of evergreens and shrubs form a pleasing background for the lawn, its flower beds and other clusters of shrubs and plants.

A band stand was constructed on this lawn and assistance given the local high school in the formation of a band. Later, when the band had developed into a permanent institution, and one of the best in the State, the stand was given to the high school and was moved to the school grounds.

Another accomplishment of that year was the planting on the mill dam. Flower beds were laid on top of the piers and boxes placed on the down river side. Beds and boxes were filled with bright colored petunias and other annuals.

In the fall of 1932, the State Highway Department replaced the old highway bridge. The new bridge is one of simple beauty and fits in well with the general scheme of things, but it required some alteration of the landscaping. After some grading and changing of the ground level, the planting was framed so as to make the new bridge an integral part of the general design.

During the summer of 1939, a large fountain was installed on the east lawn. This is electrically lighted, and at night the varicolored lights create a spectacular display—a touch of the metropolitan.

For 1940, Mr. Blandin is planning further development of the grounds north of the mill. Completion of that will probably mark the last major part in "Landscaping the Mill Property," but the job is never done. A landscape, no matter how beautiful, must not be permitted to become prosaic. Each spring thousands of annuals are planted, roses and perennials are added to and sometimes moved to different locations. Perhaps a clump of trees or shrubbery is changed, or a new variety added.

To serve this purpose better, a greenhouse and bulb cellar was erected last year. Here bulbs are stored in the fall and made ready for early spring planting. Annuals are given a start when the outdoor air is still frosty. This means earlier flowers and a longer period of the year in which the mill landscape may be enjoyed.

While Mr. Blandin has the highest appreciation for the beauty of flowers, landscaping, and attractiveness, both within and without an institution, he deems there are certain essentials of even greater importance. He is an adherent to the principle "The greatest good to the greatest number." To this finale, he is seeking ways and means to protect the employees and the people of the Grand Rapids locality so that the Blandin Paper Company, together with other assets, may be perpetuated as entity for the benefit and use of future generations.

ALUMINUM ION AND HYDROGEN ION IN PAPERS

▶▶▶ H. F. LAUNER in the National Bureau of Standards Research Paper RP1205 recently reported that a simple procedure for the determination of the pH of papers, involving cold aqueous extraction, gives values which are as closely related to the amounts of alum used in manufacture and to the stabilities of the papers as are those obtained with methods employing hot extraction. The former, by virtue of its simplicity, eliminates the factors which apparently account for the rather poor reproducibility among laboratories using the standard method. Thus, the basis for preferring the procedure involving cold extraction was practical.

Further work has shown, however, that there is also a fundamental basis for preferring the method of cold extraction. Heating of the paper-water mixtures was found to increase greatly the hydrolysis of the aluminum salts in the papers, thereby producing as much as three to four times the amount of acid originally found in the cold extract. Such large amounts of acid obscure the effects of smaller amounts of other acids which may result from cooking or bleaching operations, or which may be present owing to polluted atmosphere, any of which are known to cause deterioration of papers.

The heating operation has a further serious drawback. Partial hydrolysis of the aluminum salts in papers with the liberation of harmful acid may take place when papers are stored or shipped under warm, humid conditions, or when the drying or other manufacturing processes were faulty. This acid cannot be detected by the method of hot extraction, since the heating process causes more or less complete hydrolysis, irrespective of any partial hydrolysis which may already have occurred. The method of cold extraction, on the other hand, gives pH values corresponding to the hydrolysis equilibrium at room temperature. If the aluminum salt has been already partially hydrolyzed by faulty storage or manufacturing conditions, the acid thus liberated is measured in the unheated extract.

If the acidity of a paper, as it exists under conditions of use, can be employed as a measure of permanence of paper, and it appears that this is true, then the method of cold extraction gives a much closer measure of the significant pH values of papers than do the more complicated methods now in general use.

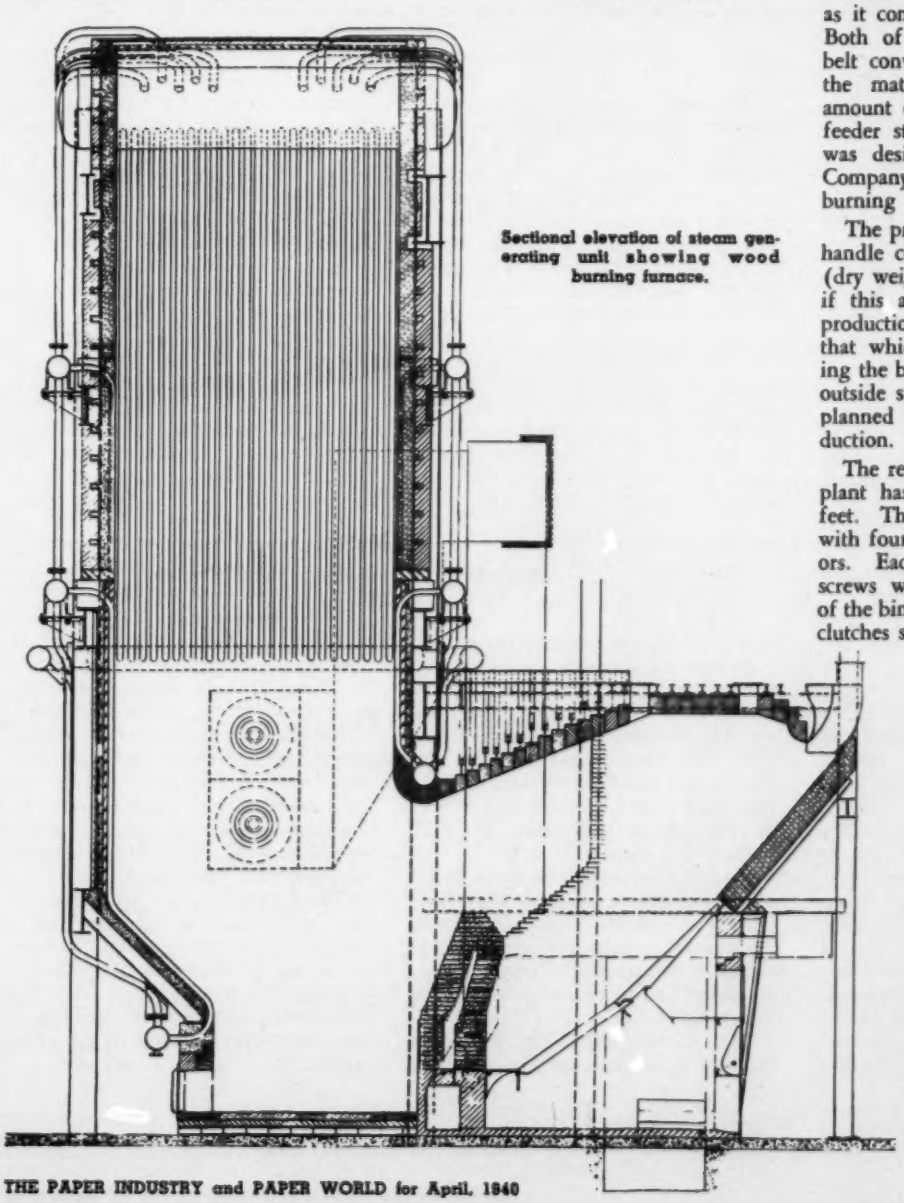
The report of this further study is contained in Research Paper RP1262.

How Baie Comeau Disposes of Refuse Wood and Bark

E. J. CALNAN
Quebec North Shore Paper Company

▸▸▸ WHEN THE MILL of the Quebec North Shore Paper Company located at Baie Comeau, Quebec, was designed in 1936, special thought was given to the problem of economically disposing of the bark and refuse which would result in the preparation of the wood for newsprint manufacture. In order to prevent stream and harbor pollution, it is essential to separate this material from the mill sewage and to use it for fill or to burn it. In this instance it was decided to burn it to the best possible advantage, using the heat for steam generation.

Various plans were studied and the scheme which appeared most attractive and which was selected was one in which four special furnaces of the type manufactured by the M. A. Hofft Company were used in combination with one of two Foster-Wheeler pulverized coal burning furnaces, so that a single boiler is used to generate steam from bark and refuse wood, pulverized coal or both.



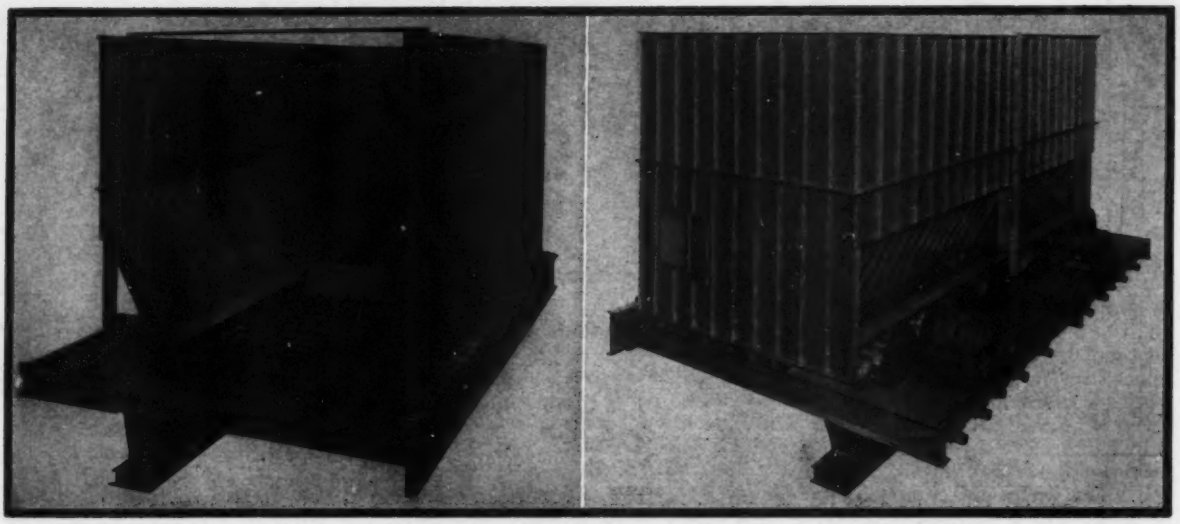
Sectional elevation of steam generating unit showing wood burning furnace.

In the wood room, a Waterous hog has been installed to break up the larger pieces of refuse wood; and a Northern bark press is used to reduce the moisture content of the wet bark as it comes from the barking drums. Both of these units discharge on a belt conveying system which delivers the materials along with a small amount of screen rejects to a special feeder storage bin. This feeder also was designed by the M. A. Hofft Company. It is located above the wood burning furnaces in the steam plant.

The press and conveying system can handle conveniently 100 to 130 tons (dry weight) of wood refuse per day if this amount is needed for steam production. The excess bark, above that which is used immediately during the barking season, is stored in an outside storage pile, from which it is planned to recover it for steam production.

The refuse storage bin in the steam plant has a capacity of 4,000 cubic feet. The bottom of this bin is fitted with four sets of feeder screw conveyors. Each set is made up of seven screws which extend the full width of the bin. The drive is arranged with clutches so that any section or various combinations may be operated at any one time. No manual handling of the bark is necessary. Speed regulation of the feeder is obtained by use of a Reeves variable speed drive.

The four furnaces are placed side by side with three solid dividing walls, each 13½ inches thick. The internal width of each furnace is 5½ feet. The bottoms of the furnaces are sloped at a steep angle and they are made up of three sections. The upper section is solid brick, 8 feet 6 inches long, and sloped at 50 degrees to horizontal. The middle



Two shop views of refuse storage bin showing (left) feed screws and (right) driving arrangement for them.

section has cast iron grate bars 6 feet 3 inches long at 45 degrees to horizontal. The lower section has grate bars 5 feet 3 inches long at 35 degrees to horizontal. At the lower end of the grates there is a 17-inch ash dump plate.

The furnace roof is of a suspended arch construction and the back walls or bridge walls which form part of the main furnace side walls are of air-cooled brick construction.

The space below the grates is enclosed and separated in two compartments which are supplied with air through adjustable dampers for forced draft control. Air for combustion is also taken to the furnace from the hollow bridge wall through three rows of openings and the flow is controlled by means of an adjustable damper. Ashes are removed through the compartment below the lower grate to a hopper outside, from which it is taken by a pneumatic conveying system.

The furnaces were designed to burn five tons (dry weight) of bark per hour at 68 per cent moisture. Under normal operating conditions this will be ample capacity to supply all steam which will be required in addition to what can be obtained from the electric boilers. Normally no coal will be used as long as bark is available. When bark is not available, the same boiler can be used to generate a maximum of 90,000 pounds of steam per hour, using pulverized coal. The unit is equipped with a Foster-Wheeler tubular type air heater, having an area of 8550 square feet; an induced draft fan with a variable speed drive and with a maximum capacity of 51,000 cubic feet per minute; and a forced draft fan of 25,500 cubic feet per minute capacity with inlet vane control.

The complete unit was designed and installed by Foster-Wheeler Company Limited and includes a ball-type coal pulverizer with two turbulent burners each capable of making 60,000 pounds of steam per hour when used separately or 90,000 pounds per hour when used together. To assist in burning the wet wood refuse a larger than usual air heater is used, and the supply air is heated to 400 deg. Fahr. The coal burning furnace is 12 feet 6 inches wide by 18 feet long and 42 feet high; water cooled on three sides.

Until now, the demand for steam has not been great enough to tax the steam generating capacity of this unit to its full extent. It has been operated for some hours at steaming rates in excess of 40,000 pounds per hour during which the CO_2 content of the flue gases averaged higher than 14 per cent, while the bark moisture content averaged 67 per cent and no coal was used. Peaks as high as 70,000 pounds of steam per hour have been reached. Therefore, it is felt that the unit will meet its design conditions with ease. At present, equipment is being installed to reclaim bark from the storage pile. When this is completed the unit will be required to burn about 15,000 tons (dry weight) of bark and other wood refuse per year. Experience to date indicates that good results can be obtained without the use of any coal provided the moisture content of the wood fuel is less than 68 per cent.

Training for Better Jobs

(*Continued from page* 43)

cause they are better trained for service.

In this division, 650 students were enrolled in the fall session which closed December 15, 1939, with an average attendance of approximately 400. The fall session included 40 classes, 555 lessons, presenting 24 subjects with a total attendance of 5,311, or an average attendance of 9.57 trainees per lesson.

Similar vocational training is being conducted in our plants at Hamilton, Ohio, and Houston, Texas. Employees are now being trained for the new addition to the Houston Division plant, which will be in operation some time this summer.

The interest shown in vocational training by our employees in all three plants is a good indication of its value. The Vocational Educational programs are always carefully prepared with the best interest of the employee in mind.

Some of our employees are taking two and three courses—learning more about the job they are employed on, also, taking some special course or studying the job just ahead of them, in order to be prepared for advancement should a vacancy occur.

Twenty years ago, vocational training was considered more or less a visionary experiment with little hope of success. However, it has exceeded even the fondest hopes of the most enthusiastic, and today no well-organized plan would attempt to get along without it.

PAPER SKETCHES

WHICH T'SAI LUN WAS REPUTED TO HAVE USED TO MACERATE THE RAGS IN MAKING THE WORLD'S FIRST PAPER, WAS TAKEN FROM HUNAN TO THE CHINESE CAPITAL AND ENSHRINED IN THE IMPERIAL MUSEUM DURING THE T'ANG DYNASTY (618-907 A.D.).

THE PRESENCE OF AN INFINITESIMAL AMOUNT OF COPPER IN CERTAIN KINDS OF PAPER WAS PROVED WHEN GOTTLIEB GAHN, SCIENTIFIC WIZARD OF THE 18TH CENTURY, BURNED A SMALL SHEET, HEATED THE ASH WITH A BLOW PIPE AND OBTAINED A TINY SPECK OF THE RED METAL.

OVER THE PERIOD FROM 1930 TO THE BEGINNING OF 1940, **DAILY** PRODUCTION CAPACITY OF PULP AND PAPER MILLS IN THE STATES OF ALABAMA, ARKANSAS, FLORIDA GEORGIA, LOUISIANA, MISSISSIPPI, NORTH CAROLINA, SOUTH CAROLINA, TENNESSEE AND TEXAS, INCREASED AS FOLLOWS: **PULP**—FROM 2,558 TO 9,945 TONS; **PAPER**—FROM 3,424 TO 9,840 TONS.

ALTHOUGH MANY PAPERMAKERS OF THE 1850'S REJECTED MELLIER'S STRAWPAPER MANUFACTURING PROCESS AS IMPRACTICAL, J. B. PALSER OF FORT EDWARD, N.Y., EMPLOYED THE PROCESS AND SOLD THE PAPER MADE BY IT TO NEARLY ALL IMPORTANT NEWSPAPERS

ALLIED

COAL HANDLING AT DOW CHEMICAL CO.

When a company uses one thousand tons of coal a day there are bound to occur several major problems of handling and storage. How the Dow Chemical Company, Midland, Michigan, went about the solution of these problems is an interesting story and because of the effectiveness of the solution, the company's method has attracted a great deal of attention.

Until 1937, the Dow company stored its coal in conical piles of eight to twelve thousand tons each. Temperatures were taken weekly and an average rise in temperature of one-half degree per day was noted. This is caused by the chemical reaction between the oxygen in the air and the constitutents of coal.

In the past, coal was dumped directly from lake boats and slack was piled loosely just as it fell. In such a pile natural classifications soon caused a separation of fine and coarse particles, the former being more firmly compacted than the larger pieces. Between each fine layer there was a coarse one, which, being loosely compacted, constituted a sort of flue. Obviously, this was a great fire hazard as these flues acted as counterparts in chimneys and in case of fire the warm air could rise through the flues allowing the cold air to filter through the coal at the bottom of the pile and feed the flames. It was often found necessary to re-pile the coal to eliminate this hazard.

At present, the Dow company stores its coal in a horizontal rather than a oblique strata, thus eliminating the formation of flues and the subsequent fire hazard. There is little to fear from spontaneous combustion since coal is packed so tightly that little oxygen can filter in. In the three years that Dow has been storing coal in this manner, no rises in temperature have been noted, even after eighteen months of continual storage. For loading, transporting and compacting, one caterpillar tractor, hauling a carryall and shoving bulldozer is used.

The Dow Chemical Company is now concluding negotiations for the purchase of 800 acres of land from the Freeport Sulphur Company on the gulf coast of Freeport, Texas, it was reported recently. The tract includes about three miles of waterfront upon which the company will build a major chemical plant to cost $5,000,000, it is said. It is expected that chlorinated products will be produced at the new plant.

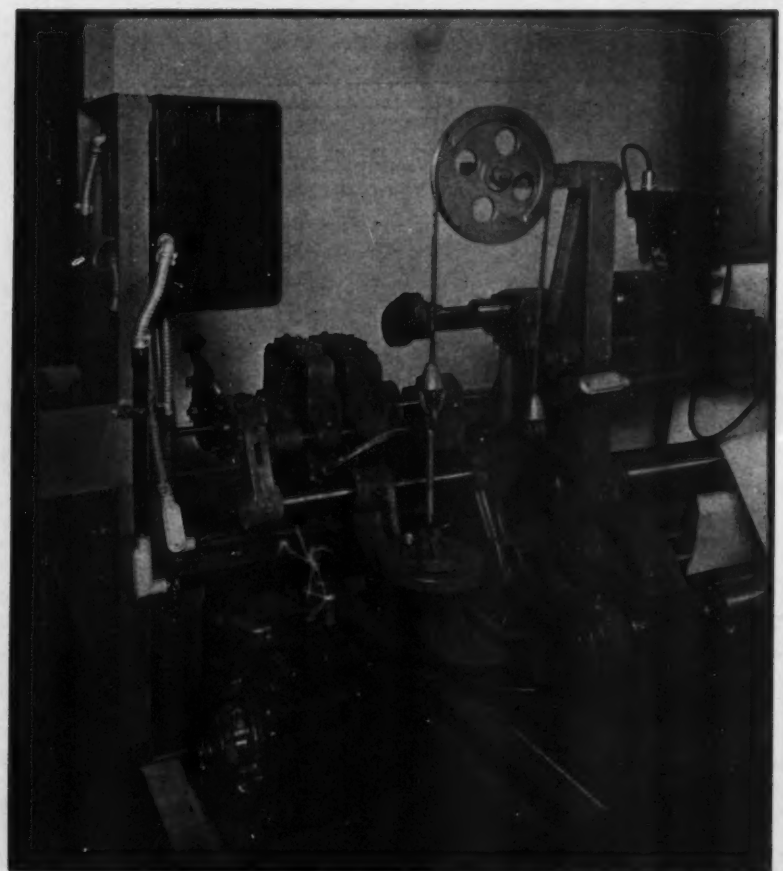
◆

▶▶▶ THE LINK-BELT SPEEDER CORPORATION, Chicago, has opened a new office in New York City to handle the sales and service of L-B Speeder shovels, draglines and cranes. The office, located at 856 East 136th Street, will be managed by E. H. Kliebenstein.

◆

PHOTOELECTRIC CONTROL FOR PAPER ROLLS

A photoelectric control which "straightens out" a paper roll has been developed by the General Electric Company. It is so arranged that should the paper coming off the roll be skewed or out of line a photoelectric side-register control system guides it back on the proper track. The control operates by means of an Amplidyne generator controlled by a photoelectric amplifier. The generator supplies power to a d-c. motor which, in turn, shifts the roll of paper to maintain registration. The accompanying illustration shows the control in operation on a Cameron winder and slitter machine.



Photoelectric control just announced by General Electric Company.

◆

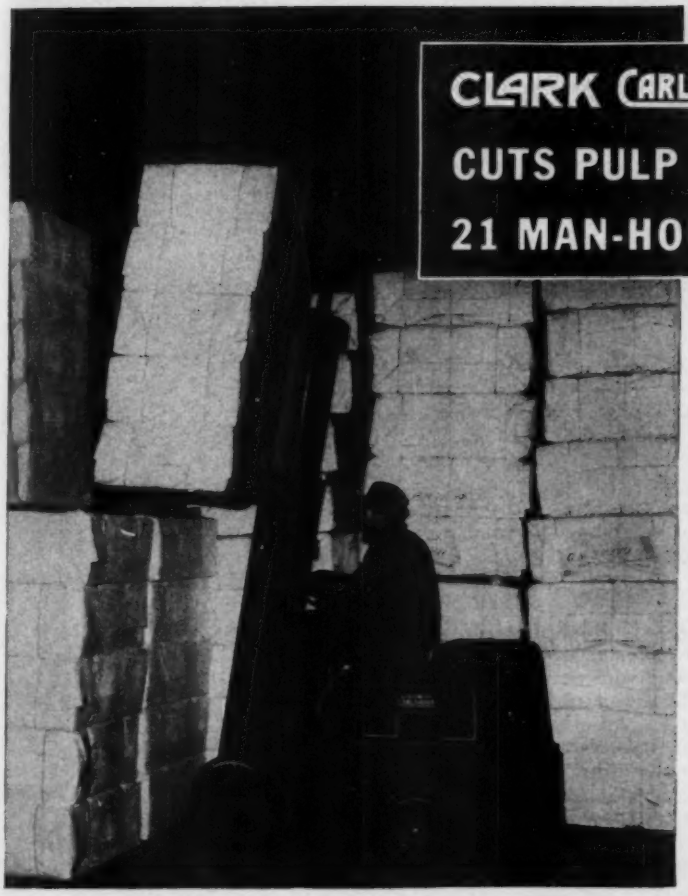
▶▶▶ A COMPLETE FINANCIAL reorganization was effected at the twenty-first annual meeting of stockholders of Filtration Engineers, Inc. Thomas C. Stephens was re-elected president and Thomas Keogh was elected secretary to replace Harris E. Skinner.

◆

MURRAY PATENTS NEW WINDERSHAFT

A new design windershaft, incorporating a number of features of interest to paper mills, has been patented by the D. J. Murray Manufacturing Company, Wausau, Wisconsin.

The shaft expands, automatically and, it is claimed, is foolproof, simple in design, and easy to operate. It has



CLARK CARLOADER
CUTS PULP HANDLING TIME FROM 21 MAN-HOURS TO 9 MAN-HOURS

At Beckett Paper Co., Hamilton, Ohio, in unloading wood pulp where car cannot be spotted at a loading dock, four men and a Clark "Carloader" take the bales from car and stack 10-high in storage in 2¼ hrs. It formerly took seven men 3 hrs. to unload the car by hand trucking and 5-high tiers in storage represented the maximum manual stacking height.

CLARK CARLOADER

tiers high— expands storage capacity

Not only does the Clark "Carloader" cut the cost of unloading wood pulp and other materials—it enlarges warehouse capacity by high tiering—eliminates manual handling of pulp from storage to beater room, handles cases, cartons, bundles and rolls economically, repeats its performance in saving time, labor and money in storing and shipping paper and paper products.

Gas-powered for 24-hr. continuous operation, this machine turns around in a freight car, carries its load at from 1 to 7 m.p.h., tiers it to 108 in. in 25 sec. Built in a number of models, 2,000 to 7,000 lbs. capacity. Write for Clark "Carloader" Bulletin.

CLARK TRUCTRACTOR

Div. of Clark Equipment Co.

122 SPRINGFIELD PLACE • BATTLE CREEK, MICH.

Turns Around In a Box Car

At Sutherland Paper Co., Kalamazoo, Mich., with loading dock matching car floor, Clark "Carloader" operator, and two helpers, unload a car of pulp and tier it in storage in less time than it formerly took four hand truckers and four pilers to do the same job. Demurrage is reduced by releasing emptied cars earlier.

a wide flat contact at pressure points, eliminating strain on pins, and in collapsing there is no rubbing action on moving parts to cause wear. The same pressure is used to collapse the shaft as to withdraw it from the paper roll. It is claimed that there is no danger of the shaft collapsing on the machine.

◆

BAKER MFG. RIGHTS TO SANDY HILL

The Baker Manufacturing Corporation, Saratoga Springs, New York, well-known manufacturers of pulp and paper mill machinery for the past sixty years, has completed arrangements with the Sandy Hill Iron & Brass Works whereby all patents, patterns, drawings, manufacturing rights and good will of the Baker Manufacturing Corporation have been acquired by the Sandy Hill organization. All of the products will now be manufactured at Hudson Falls, New York, and all correspondence pertaining to machinery formerly manufactured by the Baker company, should be addressed to the Sandy Hill Iron & Brass Works, Hudson Falls, New York.

◆

▶▶▶ IN AN EFFORT TO ILLUSTRATE the relationship between producer and the consumer, the Blaw-Knox Company, Pittsburgh, has published a very interesting brochure which contains numerous illustrations depicting the work done at the company's various divisions. The publication, issued to employees of the Blaw-Knox organization, is the second such publication to be released; the first, issued a year ago, having to do with the relationship between employees and stockholders.

◆

NEW FORMAT FOR HAERING'S "H-O-H"

The *H-O-H Lighthouse*, bi-monthly house organ of the D. W. Haering and Company, Inc., is being introduced this year in a new format and on a new quarterly publication schedule.

The publication is devoted to the dissemination of information on recent developments in the scale, corrosion and proportioning fields and is regularly distributed to thousands of chemists and engineers interested in these fields. The new *Lighthouse* has been modified in size to fit the pocket, increased in pages to enlarge the scope and is illustrated with pictures and sketches. The March issue of the *Lighthouse* is No. 1 of the new volume.

WESTINGHOUSE BOOK WIDELY DISTRIBUTED

The Westinghouse Electric and Manufacturing Company reports that last year approximately 100,000 copies of *Engineering Progress* were distributed.

Reporting outstanding new applications and developments in the electrical industry *Engineering Progress* has been published annually for the past fourteen years for the information of engineers and technical men throughout the world. This year the company doubled the book's circulation by mailing a copy to each of its 50,000 stockholders. According to the explanatory note to the stockholders this year's edition was particularly rich in the story it told of Westinghouse contributions during 1939.

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▶▶▶ THE SINCLAIR COMPANY of Holyoke, Massachusetts, has installed another wire weaving machine, bringing the total number in the plant to twenty-one. All available space in the company's plant is taken as a result of the new machine. The plant is working at capacity, according to Peter S. Sinclair, president. Last year the company imported a large German wire weaving machine, after which the latest machine is patterned.

◆

WHITLOCK COIL PIPE COMPANY CHANGES NAME

The Whitlock Manufacturing Company is the new name of the fifty-year-old Hartford (Connecticut) company hitherto known as the Whitlock Coil Pipe Company. The name was changed by vote of the stockholders on February 13, 1940.

Decision to change the name came about because of the increased activities of the company. The management of the corporation, the character of its organization and its products remain unchanged. The company will continue to manufacture its present lines of heat exchangers, storage water heaters and miscellaneous heaters for widely varying purposes and will continue its department for the coiling and bending of pipe.

◆

▶▶▶ A THREE-DAY SPECIAL WELDING COURSE will be inaugurated April 16-18 at the Ohio State University, Columbus, Ohio. The course is designed to provide basic training for practicing engineers who need instruction in welding engineering. This course will be given in place of the annual welding conference which has been held on the campus each year since 1931. The university established a four-year curriculum in welding engineering one year ago in order to meet the apparent need for collegiate education in this field.

◆

▶▶▶ A NEW ACID ACCUMULATOR has been installed in the Donnacona Paper Company plant at Donnacona, Quebec. It is said that the new accumulator will increase the mill's bleached sulphite output by 1,000 tons per month.

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▶▶▶ PLANS ARE NOW UNDER WAY for a new addition to the plant of the Dennison Manufacturing Company of Canada, Drummondville, Quebec. The company, affiliated with the American firm at Framingham, Massachusetts, expects to spend about $45,000 for the new unit.

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▶▶▶ CANADIAN BOXES, LTD., Vancouver, B. C., has awarded a contract for the erection of a $20,000 addition to the plant. Plans for the new addition call for a modern building, special emphasis being given to exceptionally good light through the installation of some 5,000 square feet of glass. The new building will measure 120 feet by 100 feet and will be 18 feet in height.

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▶▶▶ A NEW PULPWOOD CONVEYOR SYSTEM is being constructed at Cornwall, Ontario, by the Howard Smith Paper Mills, Ltd. The company is also erecting and equipping a new coal dock at the mill.

◆

Screen for Digesters

Patent No. 2,163,437. Harry H. Richmond, Portland, Ore., assignor to Electric Steel Foundry Company, Portland, Ore., a corporation of Oregon. Application February 24, 1936, Serial No. 65,319. 1 Claim. (Cl. 92—7). A screen for digesters consisting of a plurality of arcuate, perforated, channel-shaped screen sections adapted to be united into a complete circular screen whose outermost edges conform to the diameter of the interior of a digester, the intermediate portions of said screen having a smaller radius than do the upper and lower edges thereof, clamp members for holding the edges of said screen in a fixed position against the interior of the digester, and a valve controlled conduit communicating between the space existing between said screen and the digester wall and with the interior of the digester, the total area of the perforations in said screen exceeding the cross sectional area of said conduit.

Better Pulp, Newsprint, Book, Kraft

with DU PONT
REG. U.S. PAT. OFF.

CHEMICALS

Exacting paper makers prefer DU PONT Chemicals because they know that they are uniform in their physical and chemical properties.

DU PONT Aluminum Sulfate

DU PONT Aluminum Sulfate is a paper makers' alum—manufactured especially to meet the critical requirements of producers. It is used widely in rosin sizing and clarifying process water. Always uniform in its chemical properties and physical characteristics. Lump and Granulated.

DU PONT Silicate of Soda

This superior mineral loader has become "standard" in many mills. Its use increases retention of other fillers and sizes, improves formation and printing qualities of the paper and prevents "whiskers."

DU PONT Tri-Sodium Phosphate

Tri-Sodium Phosphate is a crystalline salt of uniform composition derived from minerals by a controlled manufacturing process. You will find in it those plus qualities that make it the choice for cleaning felts, as a water softener, detergent and emulsifying agent for making up size.

DU PONT Salt Cake

DU PONT Salt Cake consistently wins the approval of recovery room operators as an essential ingredient in the manufacture of proper cooking liquors for sulfate pulping operations.

OTHER DU PONT CHEMICALS FOR PAPER MANUFACTURERS

Barium Carbonate
Barium Chloride
Barium Sulfate
Caustic Soda
Soda Ash
Lead Acetate
Muriatic Acid
Sulfuric Acid
C. P. Reagents

DU PONT offers several new fire retardants for paper manufacturers that give protection against spread of flame and after-glow. We invite interested parties to write for full details.

E. I. DU PONT DE NEMOURS & COMPANY
INCORPORATED
GRASSELLI CHEMICALS DEPARTMENT
WILMINGTON, DELAWARE

Du Pont CHEMICALS for PAPER

HARMLESS WHEN HARNESSED

Pitch troubles in pulp and paper making operations may often be eliminated by the Nopco method of Pitch Emulsification.*

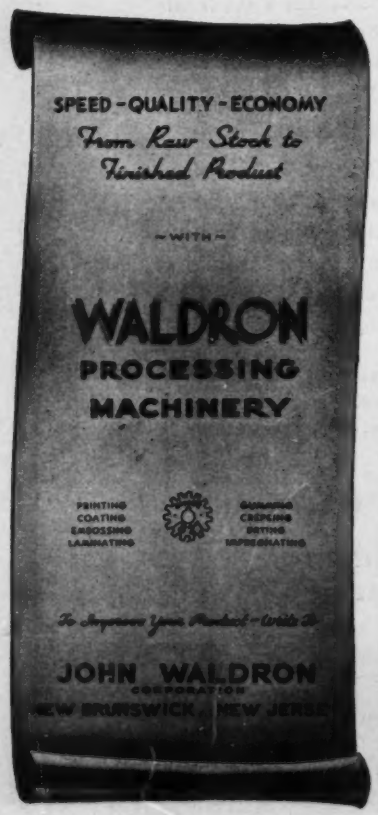
This method makes use of an especially developed emulsifier—Nopco 1216-K, equally effective in either pulp or paper manufacture.

This unique product and its simple application are completely described in an interesting booklet which you may obtain by requesting it on your company letterhead.

NOPCO
EVOLVED THRU RESEARCH

National Oil Products Co.
Harrison, N. J.
Boston - Chicago
Cedartown, Ga. - Los Angeles

* U.S. Patent No. 2144756



S A F E T Y

CONSOLIDATED DRIVERS WIN SAFETY AWARDS

Thirteen commercial drivers of the Consolidated Water Power and Paper Company, Wisconsin Rapids, Wisconsin, received safe driving awards at a dinner on March 6. Stanton W. Mead, treasurer and general manager of the company presented the awards which are given each year by an insurance company to drivers who have not been involved in a chargeable accident.

Drivers receiving four-year awards were: Walter Panzer, Hugo Wettstein, Fred Geise, George Arnett, Edward Saeger, John Henke, George Lundquist, Leonard Bulgrin, Wesley Eberhardt, John Sandrin and Albert Herms. Two-year awards went to Gerald Kaudy and Edward Johnson. Each received certificates, identification cards and honor pins for safe driving. Earl F. Otto is the truck dispatcher. J. J. Plzak, Consolidated claims manager, presided at the dinner.

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▶▶▶ THE CLOSING SESSION of the Greater Chicago Safety conference was held on March 18 with James J. Plzak, claims manager of the Consolidated Water Power and Paper Company, Wisconsin Rapids, Wisconsin, as the principal speaker. Approximately 2,000 attended the meeting.

▶▶▶ THE PRESENT EMPLOYEES of the Nekoosa-Edwards Paper Company, some 1,283 strong, represent a staggering total of 14,518 man-years of work, it was figured out recently. This figure was attained by adding individual service records. More than half of the present employees have been with the company for ten years or more.

◆

FEW LOST-TIME ACCIDENTS AT NEPCO MILLS

Lost-time accidents of the Nekoosa-Edwards Paper Company's two mills at Port Edwards and Nekoosa, Wisconsin, were reduced forty per cent during the past year. The company recently completed distribution of $2,500 in cash safety bonuses to its employees. The Port Edwards mill suffered nine lost-time accidents against eight for the Nekoosa mill, making a total of 17 accidents for the year against 29 for the previous year.

As a stimulus for safety promotion, the company guarantees $1,250 in cash for safety bonus awards and an additional contributed half of the savings resulting from fewer accidents. Safety ideas are published in the company house organ and employees submitting practical safety suggestions to the Nepco Idea-of-the-Month Club receive cash awards in addition to any safety prize money they may win.

The Paper Industry Safety Contest

July 1, 1939 to June 30, 1940

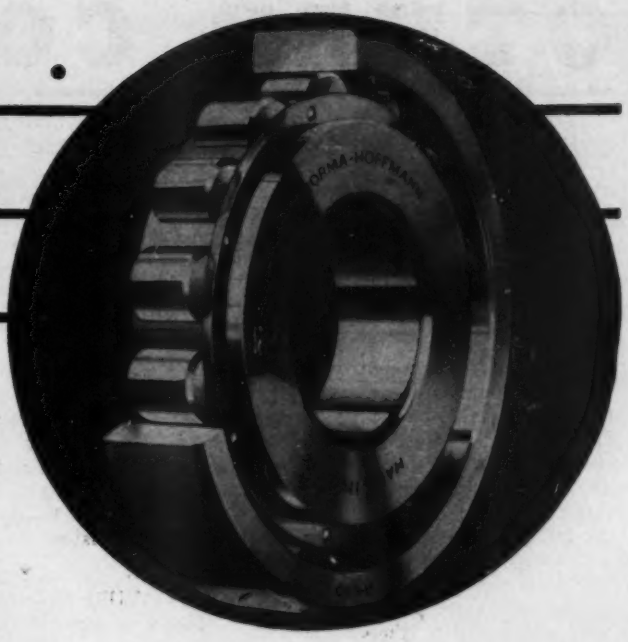
Out of 178 mills reporting for February, 14 have perfect record

PERFECT SCORES

Division I—Pulp and Paper Mills

PARTICIPANT	MILL	LOCATION
GROUP A		
Price Brothers & Co., Ltd.	Kenogami, P. Q.	Canada
GROUP B		
GROUP C		
Strathmore Paper Co.	Woronoco	Massachusetts
American Writing Paper Corp.	Linden Div.	Holyoke, Mass.
GROUP D		
The Mead Corporation	Sylva Paperboard Co.	Sylva, N. C.
Bird & Son, Inc.	Phillipsdale	Rhode Island
Crown Zellerbach Corporation	Crown Willamette Paper Co. Div.	Lebanon, Ore.
Spaulding Fibre Co., Inc.	Milton	New Hampshire
United States Gypsum Company	North Kansas City	Missouri
International Paper Co.	Livermore No. 11	Livermore Falls, Me.
The Mead Corporation	Nashville	Tennessee
Hollingsworth & Whitney Co.	Abenaquis Mill	Madison, Me.
International Paper Co.	Riley No. 23	Riley, Me.
Spaulding Fibre Co., Inc.	Hayes	New Hampshire
Division II—Paper and Board Re-Manufacturing		
Bay West Paper Co.	Green Bay	Wisconsin

For . . . . SEVERE RADIAL and SHOCK LOADS



Test this NORMA-HOFFMANN PRECISION ROLLER BEARING under your hardest conditions. Subject it to heavy continuous loads. Expose it to shock loads. Operate it at high speeds. You'll find it will stand up better than any other single-row bearing, of any type.

A few of the design features explaining this stand-up-ability are: short, solid, parallel roller construction giving maximum load contact area; completely machined, heavy-duty bronze retainer; extreme PRECISION in every detail.

"NORMA-HOFFMANN" PRECISION BEARINGS

Write for the Catalog of PRECISION BALL, ROLLER AND THRUST BEARINGS. Let our engineers work with you.

NORMA-HOFFMANN BEARINGS CORP'N., STAMFORD, CONN., U. S. A.

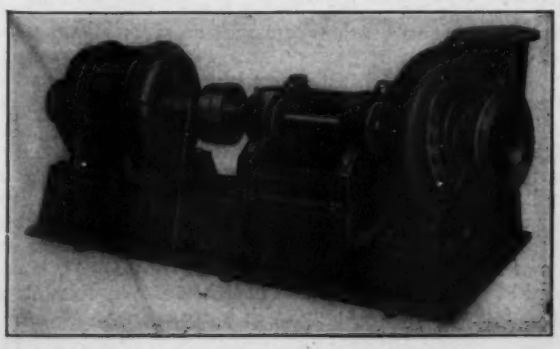
Reduce Your Costs—with a

LAWRENCE CENTRIFUGAL PUMP

BUILT TO ORDER—FOR YOU

While the LAWRENCE line is standardized as to types and basic design factors, each LAWRENCE CENTRIFUGAL sold is designed and built to meet the specific operating conditions the customer's problem presents. In this respect, each LAWRENCE PUMP is "built to order"—which explains the uniformly high economy and satisfying performance distinctive of LAWRENCE installations. May we discuss YOUR pumping problem?

LAWRENCE MACHINE and PUMP CORP'N
367 Market Street LAWRENCE, MASS.



TOP AND BOTTOM SLITTERS

SLITTER BLADES
SCORE CUTTERS
CIRCULAR KNIVES
SLITTER GRINDERS

CHARLES KOEGEL'S SONS, INC.
HOLYOKE, MASSACHUSETTS, U. S. A.

COLORS . . .
for Board and Paper

Green Chromium Oxides
Black, Brown, Red, Yellow Iron Oxides
Lamp Black—Umbers—Venetian Reds—Yellow Ochres

C. K. WILLIAMS & CO.
Easton, Pennsylvania

OTHER COUNTRIES

CUBAN CHEMISTS DEVELOP NEW CHEM. PROCESS

Chemists and botanists in Havana, Cuba, have developed a chemical process by which cellulose may be obtained from native plants, it was reported recently. The process, said to be new and hitherto unknown, will make possible the commercial production of fiber and cellulose on a very economical scale, it is claimed. Some of the claims made for this new process are: (1) that it simplifies production operations; (2) that is reduces the cost of production by more than fifty per cent; (3) that the cellulose and fiber obtained through its use are of better quality than those produced in other ways and (4) the cellulose and fiber are obtained more rapidly.

A Department of Commerce report states that the process may be said to consist of a chemical change through the introduction of a special catalyst whereby the sulphuric anhydride is transformed into hydro-sulphurous acid. The advantage of changing anhydride into hydro-sulphurous acid is claimed to be that the latter possesses stronger reducing properties than either the hydride or sulphurous acid and that it is more active than calcium bisulphite.

◆

▶▶▶ THE LEIPZIG SPRING FAIR, recently concluded, compared favorably in size and attendance with other fairs despite the confusion of war. Held in Leipzig, Germany, March 3-10, the assembled from eighteen foreign countries. Buyers from thirty-five foreign fair comprised some 6,600 exhibits countries crowded the twenty-four exhibition buildings and the adjacent streets visiting exhibits of every kind of art and industrial product.

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▶▶▶ TO FURTHER AID the "Save Waste Paper" campaign in England, the general post office is cutting down the issue of telephone directories to one a year while the war continues, thus saving some 6,000 tons of paper.

◆

▶▶▶ IT IS REPORTED in a Department of Commerce publication that the paper manufacturing industry in Colombia has not to date operated at full capacity and that considering the consumption requirements for wrapping paper on the basis of 1938 imports (some 6,000 metric tons) it would seem as if there might be room for either enlarged facilities for the present paper plant or for another paper mill.

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▶▶▶ THE GOVERNMENT OF BHOPAL, INDIA, has adopted a project for the extension of bamboo cultivation in order to enable the establishment of a paper mill in that state. Nearly 250 acres of suitable land are to be put under bamboo cultivation in addition to other tracts. Altogether, some 10,000 tons of bamboo will be available.

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▶▶▶ TURKEY HAS FORBIDDEN exports of paper and paperboard waste, according to a report from the American commercial attaché at Istanbul. The decree was issued December 12.

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ITALIAN NEWS

Cellulose

The Italians attach considerable importance to the new methods developed in that country for the utilization of native raw materials in the production of cellulose. In line with this feeling, a new plant is now being erected in the province of Chieti for cellulose production. The cellulose to be produced at this new plant will be obtained from corn straw, it is reported. The company already has some 15,000 tons of this material in storage from which, it is calculated, some 1,500 tons of cellulose suitable for papermaking will be produced.

Several new patents pertaining to cellulose production have been issued in Italy. One process involving semi-chemical pulp from corn straw, corn stalks and other products, consist of a long treatment with an alkaline solution of low concentration and at moderate temperature (50 deg. C to 110 deg. C). An oxalate is added to the solution which produces a resolvent action of the soda on the fibers while yet maintaining the fibers' original length and softness. By this process, it is claimed, a semi-chemical pulp is obtained suitable for packing paper. The operation is carried out by means of an autoclave with forced circulation of the liquor or in a rotary cooker.

Another patent covers a process whereby a good portion of the resin in pine woods is eliminated by means of an alkaline lye treatment followed by sulphite cooking with an acid having certain percentages of free and combined CaO and SO_2. The percentage of SO_2 remains unchanged throughout the treatment. Two bleaches are used, the first being a hypochlorite containing one-half of the hypochlorous acid free and one-half as a calcium or sodium salt. An alkaline treatment is used between bleachings and a sulphurous acid treatment follows the second bleaching.

Education

Some important developments in the field of technical education are expected shortly. After the first meeting of the Technical Industrial Association it was learned that professional courses not only in papermaking but graphic arts as well should be developed so that efficient employees may be available when needed by modern industry.

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▶▶▶ SWAMP REEDS AS A SUBSTITUTE for esparto grass for the manufacture of high-grade paper are undergoing experiments in England, according to an item in the *World's Paper Trade Review*. Samples of reeds have been reported upon so favorably that manufacturers are making complete tests. It is said that the reed has a high cellulose content and although inferior to esparto grass, has similar characteristics.

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▶▶▶ SCARCITY OF RAW MATERIALS for papermaking is beginning to make itself felt seriously throughout France, it is said. Shipments of pulp have been arriving at great hazard and with much delay. Waste papers are becoming scarce, and the prices are rising.

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CORRECTION

An item appearing under the heading, "Italian News," on page 1192 of the February issue of THE PAPER INDUSTRY AND PAPER WORLD, stated that a new laboratory had been established at one of the Burgo mills in Italy by that country's National Committee of Research. This was in error as it has been learned since that the new laboratory was created by Cartiere Burgo, one of Italy's largest paper manufacturers with headquarters at Torino, Via Santa Teresa 2. It is understood that the National Committee of Research is a patron.

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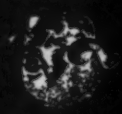

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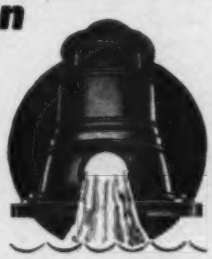

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ASSOCIATIONS

TRADE ASS'N TO MEET IN WASHINGTON

The spring meeting of the American Trade Association Executives will take place on April 29 at the Mayflower Hotel, Washington, D. C., with special addresses from speakers who have figured prominently in the economic picture as projected from the national capitol.

Secretary of Commerce Harry L. Hopkins, as chairman of the jury of award, will present the handsome bronze medallion which emphasizes the theme "Progress Through Co-Operation" to the trade association which has accomplished most for its industry during the past year. He will also award certificates of honorable mention to a number of other trade group officials.

◆

CHILSON ADDRESSES KALAMAZOO TAPPI

A very interesting meeting was held by the Kalamazoo Valley Section of the Technical Association of the Pulp and Paper Industry on March 7. The meeting, held at the Park American Hotel in Kalamazoo, was addressed by Warren Chilson of the Hooker Electrochemical Company who spoke on pulp bleaching.

Mr. Chilson's talk centered around the advisability of a paper mill installing its own bleaching equipment. He discussed many of the factors involved, such as the spread in price between bleached and unbleached pulp, the possibility of the mill being able to confine its purchases to fewer brands and the ability to arrive at special properties which might not be available on the market. The relative merits of the batch and continuous systems were discussed as to their adaptability on the market.

Following this talk by Mr. Chilson, the subject matter was thrown open to discussion by Chairman William A. Kirkpatrick II, technical director of Allied Paper Mills, Kalamazoo, after which a movie on the manufacture of tapioca flour was shown, through the courtesy of the American Cyanamid and Chemical Corporation.

◆

PLAN TAPPI SPECIAL FOR FALL MEET

It is expected that a large number of TAPPI members will attend the Association's fall meeting to be held in Seattle, Washington, August 20-23. About one hundred Technical Association members indicated at the reservation booth at the New York annual meeting that they would go, many indicating further that they would bring their wives with them. Interesting details concerning the trip were exhibited at the recent annual meeting.

An entire train, to be known as the TAPPI special, will leave Chicago at 11 P. M. on Friday, August 16. There will be but one stop en route; this to witness a performance of the famous Montana Rodeo. All Pullman and dining cars will be air conditioned. Special low rates will prevail and although the official route to the West will be the Northern Pacific, the return trip can be made over any route such as the Canadian Pacific, Southern Pacific or intervening lines. The round trip standard rail fare from Chicago (by any choice of routes) will be $90.30. Reservation should be made early through William Geiger, chairman of the transportation committee, 400 West Madison Street, Chicago.

◆

▶▶▶ WINNER OF THE Irwin D. Wolf trophy for distinctive merit in packaging this year was the Bigelow-Sanford Carpet Company, New York City. The announcement was made recently by the American Management Association, sponsoring organization for the competition. The Bigelow Weaver's Stair Tread Carton was selected from a field of more than 1,500 of the nation's packages developed during 1939. All entries were on display as a featured exhibit of the Tenth Packaging Exhibition March 25-29, Hotel Astor, New York City. The Bigelow Weavers' carton was entered in the competition by Robert Gair Company, Inc.

◆

DETROIT TO HAVE N.I.A.A. MEET

The eighteenth annual conference of the National Industrial Advertisers Association will take place September 18-20 at the Hotel Statler, Detroit, Michigan, it was announced recently.

The meeting, sponsored by the Industrial Marketers of Detroit, an N.I.A.A. chapter, is particularly important in view of the major economic changes at home and abroad affecting industry. The Toledo Industrial Advertisers Club, Toledo Chapter, will act as co-hosts. Plans for the conference are now being formulated by a general conference committee under the chairmanship of Lloyd R. Vivian of the Ditzler Color Company, Detroit, and president of the Detroit N.I.A.A. chapter.

◆

▶▶▶ THE NONOTUCK DIVISION of the American Writing Paper Corporation, Holyoke, Massachusetts, has been awarded a trophy by the Massachusetts Safety Conference for showing a reduction in industrial accidents.

CONVENTIONS AND COMING EVENTS

April 8-12 — American Chemical Society, Annual Meeting, Cincinnati, Ohio.

April 10-12—International Acetylene Association, Annual Convention, Schroeder Hotel, Milwaukee, Wisconsin.

April 16-18—All-Ohio Safety Congress, Columbus, Ohio.

April 25—Rock River Valley Safety Conference, Kenosha, Wisconsin.

April 30-May 2—Greater Chicago Safety Council, 18th Annual Midwest Safety Conference, Chicago.

May 14—Wisconsin River Valley Safety Conference, Wisconsin Rapids, Wisconsin.

May 19-20—National Paper Box Manufacturers Association, Twenty-second Annual Convention, Coronado Hotel, St. Louis, Missouri.

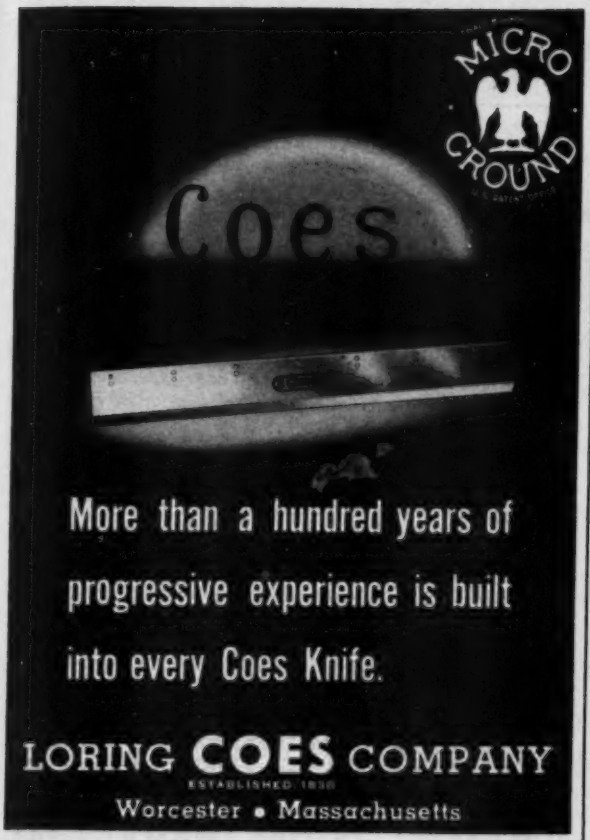
May 23—Thirteenth Annual Fox River Valley and Lake Shore Safety Conference, Marinette, Wisconsin.

June 18-20—American Pulp and Paper Mill Superintendents Association, Annual Meeting, Netherland-Plaza Hotel, Cincinnati, Ohio.

Aug. 20-23—Technical Association of the Pulp and Paper Industry, Fall Meeting, Seattle, Washington.

Oct. 7-11—National Safety Congress and Exposition, Stevens Hotel, Chicago.

Dec. 2-7—Fourteenth National Exposition of Power and Mechanical Engineering, Grand Central Palace, New York City.



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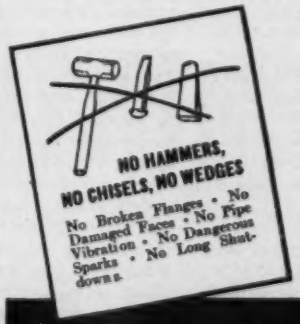
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Convention Papers . . . Abridged

Developments in Synthetic Resins and Resin Emulsions

FREDERICK J. MYERS, Research Chemist Resinous Products and Chemical Co., Inc.

The discussion will be confined to applications wherein the product is essentially paper modified by the presence of small proportions of resins.

A survey of the literature and patents dealing with this aspect of the paper industry reveals very little, and, although there are numerous patents disclosing uses of resins in paper, investigation shows that they are, as a rule, specialty applications. Furthermore, it would appear that much of the work relates to paper coating. Compared with the costs of the usual papermakers' chemicals such as rosin, wax, starch, alum, etc., resin prices appear to be high. However, the higher prices should be compared not with the prices of the other materials, but with the increased effectiveness or unique effect obtained, ofttimes impossible with other substances. In addition, it is generally true that increased use brings reduced prices.

One of the most interesting resin types for paper applications are the urea-formaldehydes. These resins, formed by the condensation of urea and formaldehyde, may be obtained as dry, crystalline, water-soluble, powders, as water-soluble pastes, as aqueous suspensions or true solutions, or dissolved in organic solvents. They are of the thermosetting type, requiring heat treatment to reach their ultimate condition and the cured resins are characterized by freedom from color and odor, extreme hardness, and insolubility in water or organic solvents. Because curing is essential and heating periods available in paper manufacture relatively short, it has been necessary to develop special catalysts, the use of which combines satisfactory working life with rapid cure at available temperatures.

These resins, as aqueous solutions or suspensions, have been used in the production of high wet strength papers [American Reenforced Paper Co., French patent 821, 840 (Sept. 6, 1937); Bowen, A. H., and Dike, T. W., U. S. patent 2,098,082 (Nov. 2, 1937); Moss, E. W., British patent 502,855 (March 21, 1939), British patent 502,856 (March 21, 1939); Scott Paper Co., British patent 502,724 (March 21, 1939)]. As generally carried out, the resin, suitably catalyzed, is applied as a tub size, and the heating obtained by passage through the remaining dryers effects the polymerization of the resin and produces wet strength. At lower concentrations, 2-5 per cent resin (on paper weight), the sheet is essentially the same as before treatment except for markedly increased wet tensile strength, but at higher resin concentrations, harshness and lack of flexibility results. This can be overcome by the use of suitable plasticizers. There is considerable evidence to indicate that urea-formaldehyde condensates react with starch and protein to form compounds which differ from either of the original reactants. Thus, in the production of high wet strength papers, the urea-formaldehyde resin can be diluted with starch and, although starch itself will produce no measurable wet tensile increase, the combination gives values equal to those obtained with the resin itself.

This "protective" or waterproofing action of urea-formaldehyde resins on starch suggests many possible applications wherein starch, an inexpensive raw material, may be modified at low cost to produce a material which exhibits one of the properties lacking in starch, namely, water-resistance.

Experimental results have shown that this resin-starch combination may be used as a laminating paste, giving bonds which are stronger than those of starch and infinitely more waterproof. In this application also, careful choice of catalyst is required to balance working life with speed of cure, since the much higher concentrations used promote more rapid "bodying" of the unheated material.

Indications are that the starch-resin combination has possibilities as a binder in clay coatings, and, while much remains to be done, this application shows definite promise.

Such properties of the urea-formaldehyde resins as lack of color and odor and water solubility would suggest that they may find broader application than many of the other available types.

Closely akin to the urea-formaldehyde resins in general properties are the phenol-formaldehyde resins. Although originally prepared from phenol and formaldehyde, the types now produced are too numerous to mention, much of the difference being due to the use of modified phenols of varying degrees of molecular complexity. From the standpoint of the present discussion, the water-soluble unmodified phenol-formaldehyde condensates are the most interesting. They are thermosetting, and the cured resin is dark in color, odorless, and very brittle and hard. Use has been made of this type in enhancing wet strength and since acid-precipitable types can be prepared, beater sizing is indicated. The dark color and relatively high curing temperature required make these condensates inferior to the urea-formaldehyde types for most applications.

The alkyd resins are formed by the interaction of dibasic acids and polyhydric alcohols such as phthalic acid and glycerol. In general, the more important types are prepared by modification of the glycerol phthalate with oils or the fatty acids thereof, since the unmodified types are hard and brittle and not conveniently used. Modifications with drying oils give many products of industrial importance, but since these products require baking at elevated temperature, or prolonged air drying, their use in the usual paper-making cycles would appear to be limited. The non-drying modifications, such as those prepared with coconut, cottonseed, stearic, oleic, oils or acids, do not require curing, and so may be used in the usual schedules. Except for a few isolated examples, alkyds are not water-soluble and so they must be used as aqueous dispersions, organic solutions, or in the molten condition. Color and odor depend on the type of oil or fatty acid used and those prepared from the non-drying acids are light yellow, wax-like, water-repellent, grease-resistant solids. Aqueous dispersions of these resins, especially when combined with modifying agents, would be suited for use as sizes, impregnants, or coating materials, to improve water and grease resistance of paper stocks. When present in small proportions, the paper is sized to water inks, i.e., feathering is prevented but the sheet is not water repellent. Thus, papers in which rosin or alum sizing would be objectionable can be sized satisfactorily with these emulsions. Increasing the resin content of the paper increases water and grease resistance until the point is reached at which the paper becomes both water and grease proof. Non-drying alkyds may be used in conjunction with starch to increase the water repellency of the starch, or may be used as a greaseproof coating with starch. In these instances, the resin apparently acts as a binder for the starch and increases film continuity.

Calcium carbonate-containing papers cannot be sized in the normal manner by the use of rosin and alum, and several expedients have been adopted to effect the required sizing. As previously mentioned, tub sizing with a non-reactive resin dispersion can be used but many patents disclose methods of pretreating the carbonate with resin or wax prior to incorporation in the paper. Treatment with resin emulsions coats the filler with a protective film and the paper may then be sized with this resin-carbonate size or sized in the usual manner with rosin and alum without encountering foaming and the destruction of the carbonate and alum. Oil-modified cumar resins, alkyds, or waxes including paraffin may be used.

The remaining resin types such as the acrylates, vinyls, polyisobutylenes, styrenes, etc., will be considered as one group. As a rule, they are water-white, odorless, thermoplastic, tough, flexible resins which find wide use today. They are insoluble in water and may find use in the paper trade, especially as aqueous dispersions. At present,

A large number of the papers presented at the annual meeting of the Technical Association held in New York City, February 19-22, 1940, have been digested and regular installments will be published until completed. The first presentation of these abridgments appeared in the March issue.

high costs have limited their use to specialties, but their general properties are such that more widespread use would be anticipated in the future.

Specialty papers such as photographic papers must have properties which cannot be obtained with the use of starch, glue, rosin, etc., and Lane and Peters have proposed the use of water-soluble polyvinyl acetals as sizing agents. Sizing is effected in the beater, and the finished sheet exhibits high tear and wet strength, excellent aging properties, and is well-suited for photographic purposes. The resin content ranges from 0.2-5 per cent, based on the weight of the paper.

Schweitzer proposes to waterproof cigarette papers to prevent disintegration on accidental wetting by treating with solutions of synthetic resins. A special method of application, giving a discontinuous film, imparts water-resistance without impairing porosity. Suitable resins include the natural resins, such as gum mastic and rosin, and synthetics such as ester gum, cumar resins.

A more recent innovation in the coating field is the use of hot melts. These mixtures, for which many resin types may be used, are applied to the paper in the molten condition, thus eliminating the expense and hazard which arise from the use of solvents.

More pertinent, however, is the use of aqueous dispersions or emulsions. These water-miscible materials may be used in the usual papermaking procedures and so do not entail radical changes in equipment. Depending on the type of resin, they may be solvent-free, or contain varying amounts of solvents. The films therefrom may require curing or baking to reach their ultimate condition, or mere loss of water may give the finished film. Spraying, roller or brush coating methods may be employed, and the choice of the specific product will depend on the desired properties and the application method being used.

This paper is of a general nature, but it is hoped that it will be considered as an introduction to the subject of resins in paper and a survey of the present status of the art. A study of the growth of interest in the last few years indicates that resins are being looked upon by papermen as possible tools to make the new products being constantly demanded and to modify present materials for new uses. As experimental and commercial applications progress, more specific information will become available and it will then be possible to present papers containing details of technical importance. Thus the responsibility for progress would appear to rest on the shoulders of the papermen as well as on those of the resin chemist.

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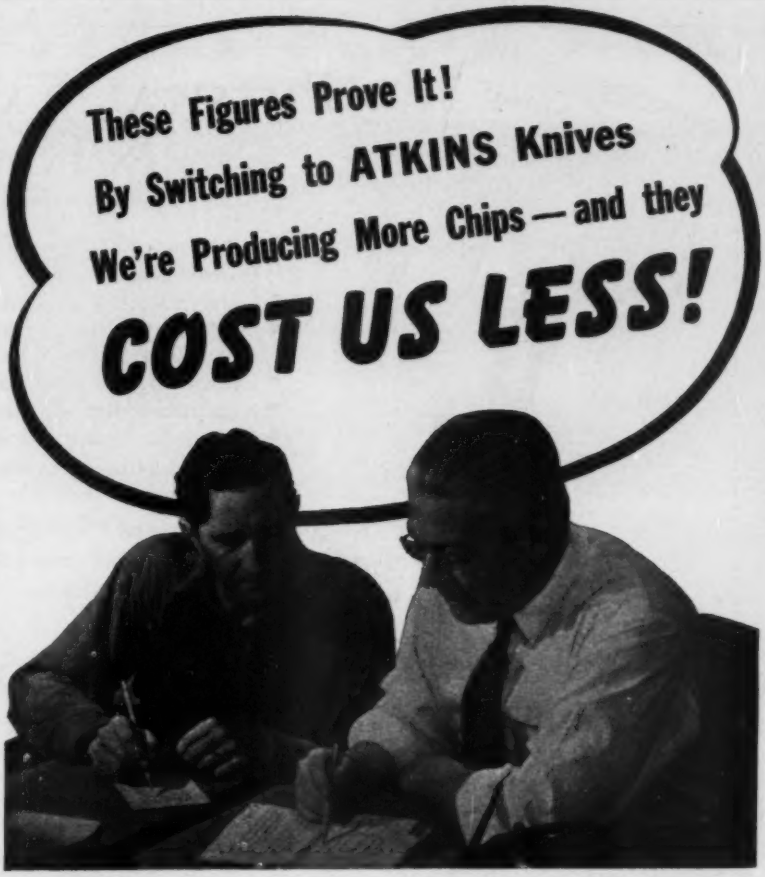

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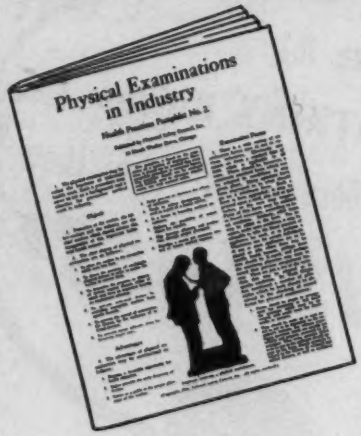

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would be more vociferous, except that these individual demands have been satisfied by recommendations of testing laboratories, by certain container manufacturers, and in some instances by the buyers themselves from their own experiences. For instance, one container manufacturer stamped on his cases that they were guaranteed to resist a specified number of falls in the revolving drum test. Another stamped on his product a guarantee that it would resist a specified crushing load. A number of buyers have set up standards based on one or the other of the above guarantees. One large user deevloped an excellent puncture tester which he thinks is a good criterion of quality and proposes to use it as his standard.

As is to be expected from such a situation, these various standards differ greatly in concept, in details, and in merit.

The Container Committee of TAPPI was oragnized to serve the purpose of developing adequate standards for these products. Likewise sub-committee IV of Committee D-6, of ASTM, was organized to serve this same purpose.

Sub-Committee IV, by agreement has been more active up to this time even though its activities have accomplished no more than to clear the right of way for progress. Its personnel includes seven representatives of our larger container and container board manufacturers, six members who represent users of these products including one member who is an active worker in the National Association of Purchasing Agents, and six members who are neither producers nor consumers, but who represent the rail carriers, two government testing laboratories, and two commercial testing laboratories who specialize in these products.

To accumulate data which we hoped would be sufficiently authoritative to lead to a unanimous conclusion, the sub-committee drafted and carried out eight series of tests in six well equipped and experienced container testing laboratories. Two of these series were made in the U. S. Forest Products Laboratory; two in the Forest Products Laboratory of Canada; two in commercial testing laboratories; and the other two in testing laboratories of producers. The study included data on humidity controls, moisture content determinations, hours to stabilization, Mullen or Cady bursting tests, crush tests of boxes and revolving drum tests of boxes. The boards represented jute, cylinder kraft, and fourdrinier kraft liners, .016 in. and .030 in. calipers, and straw, kraft, and chestnut corrugating boards. Each testing agency made about 1000 determinations or a total of about 7000 for the entire study. It is believed that the materials used are representative of all those in more general use and that the data have a general application.

The conclusions from these studies are being compiled at this moment. The results are not available as yet for use. But the study is indicative of how seriously subcommittee IV is approaching the problem.

Our program is divided into two sections. The first is an endeavor to set up standard methods for making tests. The second phase is to set up standards of quality for these products.

Performance of Sodium Silicate Adhesives in the Manufacture of Corrugated Fiberboard

E. R. BOLLER[1], J. G. LANDER[2] and R. MOREHOUSE[3]

In the production of corrugated fiberboard, the efficiency of the manufacturing operation and the quality of the finished product are determined both by the quality of raw materials used and by the engineering practices employed. Optimum performance, with regard to both production and quality, requires good materials and good engineering. In this paper, sodium silicate adhesives are considered in connection with the other raw material, paperboard, and the more pertinent engineering factors.

Sodium silicate adhesives are delivered at the boxboard plants either in solution or in anhydrous form. Silicate solutions are ready for use when received and conform to close specifications on composition and properties. These solutions may be stored for long periods of time in closed steel or concrete tanks at atmospheric temperatures without any change in physical or chemical properties.

The quicksetting characteristics of silicate adhesives have made possible the high operating speeds of modern corrugating machines. At the same time, the silicate

(1) E. I. du Pont de Nemours & Co., Grasselli Chemicals Dept., Cleveland.
(2) Diamond Alkali Co., Standard Silicate Div., Pittsburgh.
(3) Philadelphia Quartz Co., Philadelphia.

produces a strong bond and of itself contributes to the strength of the assembled board.

Sodium silicate forms an adhesive bond by loss of water. It is characteristic of a silicate solution that its viscosity, or cohesive strength, increases with concentration. When a certain concentration is reached, the increase in viscosity becomes extremely rapid and the solution changes first to a tough plastic mass and finally to a firm solid.

The ultimate tensile strength of the silicate when completely dried is about 750 lb. per sq. in., which is many times that of the paper.

The viscosity of silicate solutions increases rapidly with lowering of temperature. The temperature effect on viscosity is greatest with silicates having reduced water content.

There are two means by which water may be removed from the silicate solution to cause setting of the adhesive bond. The water may be lost by evaporation to the atmosphere or absorption by the paper. While no definite data are available on this point, it seems probable that absorption by the paper is the more important factor in securing preliminary set of the adhesive bond on the machine; and evaporation, especially by diffusion through the board, is the more important in obtaining final set of the bond.

Composition of a sodium silicate solution, that is, the silica-soda ratio, is quite important in determining its adhesive properties. Sodium silicate having a ratio of about 2.8 shows the greatest cohesive strength. Silicates having a high ratio, as 3.5 or above, exhibit rather low cohesive strength until they are thoroughly dried. It has been found from consideration of all factors that silicate solutions having a ratio of from 3.15 to 3.35 are satisfactory for use with modern corrugating machines. In most cases, the preferred range is from 3.2 to 3.3. The most satisfactory concentration for silicate adhesives corresponds to gravities from 40.0 deg. to 42.5 deg. Bé. at 60 deg. Fahr.

Within the past few years considerable attention has been given to adhesives consisting of clay dispersed in sodium silicate solutions. The addition of the clay does not markedly change the adhesive properties of sodium silicate, but it does increase somewhat the effects of both concentration and temperature on the viscosity.

The mechanical principles of the corrugating machine determine the manner in which the adhesive bond of corrugated fiberboard must be formed. The silicate adhesive is applied by means of a transfer roll to the tips of the flutes on one side of the board, the liner pressed against the adhesive covered flutes and the bond subjected to temperature and pressure. After a few seconds the same process is repeated on the other side of the board. With the more modern machines, the whole operation may be completed within 15 seconds. At the end of this time the adhesive bond must be sufficiently strong to hold the components of the board together when subjected to ordinary handling.

Thorough examination of a large number of corrugated board specimens has indicated that it is not sufficient to have just

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DIFFUSERS-

(Above): Interior view at the Kraft Corporation mill, Fernandina, Fla., showing some of the six welded diffusers installed there.

COOKERS-

(Right): Two of six 10 ft. dia. by 22 ft. stress relieved vertical cookers for the Rayonier sulphite mill at Fernandina, Fla.

DIGESTERS-

(Directly Above): One of four steel sulphate digesters for the St. Joe Paper Co., at Port St. Joe, Fla. The larger view shows four sulphate digesters for the Gaylord Container Corp. All four units were x-rayed and stress relieved after fabrication.

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a thin film of adhesive at the line of contact between the corrugating medium and the liner. A good bond should have an excess of silicate at either side of the line of contact, forming shoulders which act as reinforcements. Furthermore, the overall strength of a bond will be directly proportional to the width of the adhesive strip in contact with both plies. An adhesive strip less than one millimeter wide is seldom satisfactory and a width of two millimeters is preferable.

Desired degree of penetration, .001 to .002 inch, can be regulated by proper control of the adhesive, of the paperboard, or of both. Penetration of the silicate is favored by low viscosity. Penetrability of the paperboard can be increased by raising its moisture content, as by steaming during the corrugating operation. Penetration of the silicate may also be obtained by any change that slows its setting rate, permitting it to remain longer in a fluid state.

On the other hand, it is necessary to avoid too great penetration of the adhesive into the paper. If penetration is excessive, a considerable portion of the silicate is pulled away from the adhesive bond, producing a bond which is narrow, has no shoulders and is consequently quite weak.

It is possible to secure bonds of fairly satisfactory structure in many cases with fairly deep penetration of the silicate, especially when an excessive amount of adhesive is used. Although the bond strength may be entirely adequate, such practice may produce other undesirable effects. Sodium silicate is an alkaline material and if it penetrates through the liner it will produce a discoloration on the exterior surface.

The methods used for controlling penetration of the adhesive into the paper during the formation of the bond are also useful in promoting the setting rate of the silicate. The silicate solution showing optimum penetration for any given paperboard combination is usually the one which will set most rapidly. The paperboard having a moisture content permitting optimum penetration of the silicate will usually absorb water from the silicate adhesive most rapidly. It should also be noted that proper control of penetration produces bonds of maximum strength.

Uniform application of the adhesive constitutes one of the most important requirements for its satisfactory performance.

Breaks of any kind in the silicate bond, or presence of weak bonds, are sources of weakness in the corrugated board. The number and size of these deficiences in the adhesive bond depend upon a number of factors including the type of machine, manner in which it is operated and properties of the adhesive. Common causes are transfer roll out of round, non-uniform adjustment of the doctor roll regulating thickness of adhesive film on the transfer roll, worn and non-uniform corrugating rolls, use of too little adhesive and use of an ahesive having either too great or too low a viscosity.

Non-uniformity in the application of silicate, areas which are bare or deficient in amount of adhesive, is a frequent cause of blisters on the board coming from the machine. In these instances the blisters can often be suppressed by slowing down the speed of the machine.

Emphasis should be placed on control of clearances on silicate transfer rolls which regulate amount of adhesive applied. The optimum settings for any particular case can be determined by a little experimenting.

To secure optimum performance with a corrugating adhesive, it is important that uneven tension on the components of the board be avoided.

After the silicate adhesive has been applied to the tips of the corrugations and the liner has been brought into contact with them, it is desirable that such contact be maintained and undue stresses on the bond be avoided until a preliminary set is obtained.

The flutes in corrougated board have been carefully designed to give maximum strength and rigidity to the finished board. Any distortion, breaking or crushing of these flutes necessarily impairs the strength of the product. Much of the resultant danger of injuring the flutes is avoided with silicate adhesives.

Sodium silicate is an excellent adhesive for many materials other than paper. Consequently, if a silicate adhesive is allowed to come in contact with a hot metal surface, it will adhere quite tightly. Under certain conditions there may be an accumulation of such adherent silicate on the heating platens of the corrugating machine, which requires time to remove. It is desirable to have the heating platens treated in such a way that the dry silicate film may be readily removed. It has been found possible to achieve this by coating the heating platen with colloidal graphite. A dilute aqueous dispersion of the graphite is sprayed onto the hot platens at frequent intervals until a satisfactory coating is built up, and after that applied only sufficiently often to maintain this coating. Dehydrated silicate does not adhere to the graphite and may be readily removed.

The optimum amount of silicate for combining corrugated fiberboard is rather variable. Consumptions reported in regular production varying from 16 to 30 lb. of silicate per M sq. ft. of "A" flute board have been noted. With good practices the normal application is from 18 to 24 lb. of silicate on average proportion of "A" and "B" flute board. With "B" flute board, the silicate consumption is generally from 15 per cent to 30 per cent higher than "A" flute.

In general it may be stated that the necessary silicate consumption is inversely proportional to the mechanical condition of the machine. The consumption of much less than 18 lb. of silicate causes nonuniform and spotty adhesion unless the equipment is in good mechanical condition. In most cases, consumption below 16 lb. are possible only with excellent equipment in conjunction with close control and supervision. It is often possible to improve the strength characteristics of corrugated board to a significant extent by using an amount of silicate appreciably greater than the minimum necessary for satisfactory performance in the manufacturing operation, as 20-25 per cent beyond the minimum requirement.

It should be noted that the cost of the adhesive is but a very small fraction of the total cost of corrugated board, approximately 2 per cent to 4 per cent. Any improvement, either in operating performance or in quality of the product, which can be secured through the use of an amount of silicate above the bare minimum is probably cheaper than a like improvement secured by any other means.

The advances made in production rate of corrugated fiberboard during the past fifteen years, from 100 ft./min. to speeds in excess of 300 ft./min. and of 400 ft./min. in occasional instances, have been achieved using silicate adhesives. Silicate solutions are especially suited to such high speeds because of the mechanism by which they set to form an adhesive bond, that is, by the loss of a small amount of water.

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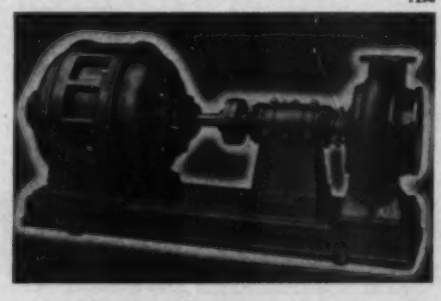

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In any consideration of production rate, the most important item is not the maximum speed obtained but the average speed. The average production rate will depend not only upon the maximum speed at which the equipment can be operated with production of satisfactory board, but also upon steady operation.

An important factor in efficient operation of a boxboard plant is the production of a minimum amount of waste.

Some waste on account of side trim is necessary and the percentage of this type of waste depends upon the judgment of the planning department, the size of the paper rolls in stock and orders received. Another source of waste is roll wraps and roll stubs. Obviously these types of waste are in no way connected with the corrugating adhesive. The only other source of fabricating waste is that of "broke" coming from the end of the machine. It is possible that the characteristics of the adhesive used might have some influence on this type of waste.

Only a minor portion of the total waste production could possibly be attributed to the silicate. It would seem that the value (0.25 per cent) represents a fair average, although for any given short period of time appreciably higher or lower values might be observed.

Warping of corrugated board frequently occurs as it leaves the double facing unit. In the majority of cases, this warping is caused by a lack of balance in the moisture content of the individual components of the board, resulting in uneven contraction upon seasoning and drying. Warping will result from using on one face of the board a liner having a moisture content appreciably different from that of the liner on the other face. The same effect is produced if one liner picks up more moisture than the other liner during the combining operation. It follows that warping can be corrected by controlling the moisture content of the board. Silicate adhesives introduce only a small amount of moisture into the paper in the combining operation because of the small water loss necessary to set the adhesive bond. Obviously the smaller the amount of moisture introduced into the board during bond formation the easier it will be to preserve the desired balance. In fact, it is usually necessary that water be introduced from other sources before it is possible to produce warped board with silicate adhesives.

Board glued with the usual silicate adhesives can be taken directly from the corrugating machine to the other box-making operations. At this point, it will have sufficient strength to withstand the pressures normally encountered in printing and in taping. The strength of the adhesive bond is also sufficient to withstand stresses put upon it by the scoring and slotting operations.

The operating performance of silicate adhesives follows naturally from the fundamental properties of sodium silicate solutions. With due attention to the conditions imposed by these properties, a maximum of efficiency in operation and of product quality is attained.

Centralized Lubrication

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Special Representative
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When we consider the absolute need for speed regularity in making paper which is largely dependent upon lubrication, the cost of a modern continuous paper machine and the possible loss of production which may result from shutdown due to insufficient lubrication of a single vital part, there is little wonder that the "Rule of Thumb" lubrication methods of a few years ago are being discarded in favor of the scientific attention which the lubrication problem deserves.

The most complete and efficient lubrication system costs little in comparison to the cost of the paper machine which it serves, and the possibilities of losses due to lubrication failure, therefore, warrant the installation of the best equipment available.

While there are many machines operating satisfactorily from centralized systems utilizing overhead gravity feed tanks, the modern tendency is toward delivery of the lubricant under pressure by circulating pumps drawing lubricant from central main oil reservoirs located under the machines —which pumps are usually installed in duplicate with automatic controls to insure maximum reliability of operation.

The main oil reservoir, in addition to holding sufficient oil so as not to recirculate the oil too rapidly, should be designed to maintain certain fixed flow velocities dependent upon the viscosity of the

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are specially designed for the job. They wet almost instantly, penetrating completely to loosen all the load. They rinse out rapidly and *completely*. Magnus-conditioned felts have the softness and porosity of new felts, with full naps. They do not load up again as quickly.

Harmless to wool fibers, Magnus Conditioners will nevertheless restore porosity to felts that have been rendered waterproof by lime deposits. They are particularly valuable in saving time on the job of breaking in new felts. There's a type of Magnus Felt Conditioner to meet your specific requirements and add greatly to felt life, besides eliminating production losses due to loading.

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oil in service. Further, the tank should be equipped with adequate automatically controlled heating and cooling surfaces with proper baffling for the most effective use of this surface, thereby maintaining the lubricant within desired temperature conditions. In most cases, normal temperature requirements for oil supplied to bearings is 100 deg. Fahr.

Lubricating oils employed in the paper industry are subjected to hard service and possibly more contamination than most other high speed services. While leakage of water into the lubricating oil and resultant emulsion troubles have been minimized in many new machine installations as a result of improvements in bearing seal design, there is still considerable moisture contamination trouble due to high atmospheric humidity and condensation. Further, lubricants are contaminated with paper fibers, paper dust, and other solid contamination in service as well as being subjected to high temperatures which result in oxidation of the oil and subsequent sludging due to deterioration products.

The most satisfactory method of maintaining the oil in clean dry condition for the protection of the points lubricated is to use filters embodying the principle of automatic and continuously cleaned edge filtration for 100 per cent of the oil flow to the machines and to supplement this filtration on a by-pass system with efficient centrifugal purification for the complete removal of water, sludge, and deterioration products which when first formed are more soluble in water than in oil.

The installation of a properly designed centralized lubrication system insures the delivery of the correct amount of oil at controlled temperatures to the points being lubricated, thus minimizing the possibility of lost production and reducing maintenance cost of the paper machine itself. Further, such a system will provide economical lubrication if the design incorporates means for keeping the main body of oil, which often amounts to several thousand gallons, in clean dry condition free from deterioration products, thereby many years of life of which modern oils permitting its continuous reuse for the are capable when properly maintained.

Statistical Survey of Rosin as Used in the Paper Industry

P. K. BAIRD, Senior Chemist,
and
C. E. CURRAN, Principal Chemist,
Forest Products Laboratory,[1] Forest Service,
U. S. Department of Agriculture

The technical and economic position of rosin as a papermaking material is discussed. Rosin is shown to be the principal sizing agent for paper at the present time, and an analysis of use for the past two decades shows that the demand for rosin by the paper industry has no doubt controlled to a great extent the price and production of this naval stores product. The technological position of rosin is shown to be strong and will probably continue so in spite of the availability of certain substitutes. The supply is ample, the cost low, and the technical use problems less numerous and complex than for any substitutes thus far tried.

(1) Maintained at Madison, Wis., in co-operation with the University of Wisconsin.

The Dieckbrader Vacuum Deckle for Cylinder Machines

A. YRAOLA, Chemist
The Hinde & Dauch Paper Company of Canada, Ltd.

It is not possible to arrange orders so that they trim to the full width of machine on all cases in the average board mill. As a result, a certain percentage of the full width of the machine's production is lost as trim. Probably an average figure for most mills would fall between 5 and 10 per cent. In consquence, in most board mills, and particularly those making the higher grades of board, there is an appreciable loss.

A solution for this problem that has been found ideal in two years of continuous operation was found in the vacuum deckle. The vacuum deckle consists of an adjustable vacuum member extending over the cylinder mold just above the level of the stock in the vat. It is movably connected to a separating tank and vacuum pump by means of piping. A small contrifugal pump is connected between the separating tank and the stock chest supplying the cylinder mold the vacuum deckle is applied to.

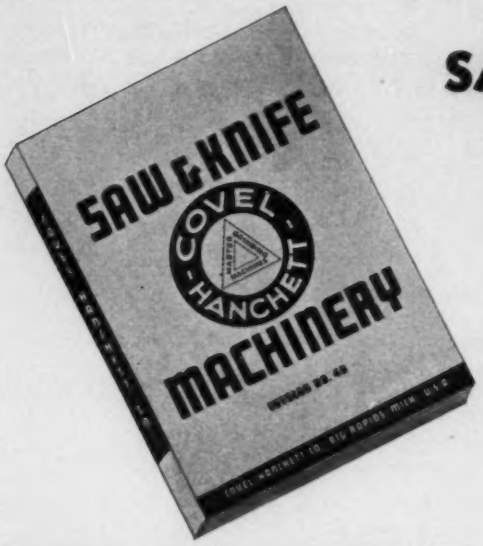
In operation, the excess stock is removed by the vacuum deckle from the cylinder mold. The vacuum supplied by the pump causes the stock removed to enter the separating tank. The pulp falls to the bottom of the tank, while the air separated goes to the vacuum pump and is exhausted to the atmosphere. The pulp is pumped from the bottom of the separating tank back to the appropriate stock chest.

When the vacuum deckle is in operation all that is necessary to change the width

of the liner ply or plies is to slide the vacuum deckle or deckles out or in. The adjustable tube is marked in inches for convenience.

More than one vacuum deckle may readily be used on a cylinder machine, whether for the purpose of reclaiming excess liner or for reducing the trim of the whole machine.

Acknowledgements: The vacuum deckle was invented by F. A. Dieckbrader of the Hinde and Dauch Paper Company of Canada Limited. British and Canadian patent have been granted and United States patent have been applied for.



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The Photoelectric Determination of the Permeability of Paper to Fluids

HOWARD L. VINCENT
George Vincent, Inc.

Previous methods of determining rates of penetration of fluids into paper have generally been either gravimetric or optical, of which the Cobb and Fuess methods, respectively, are typical. The method and instrument to be described represents a further development of van den Akker's photoelectric instrument, using standardized penetrants and a system of plotting results which yields characteristic indices of the permeability of papers and which are strictly comparable over a wide range.

The instrument constructed permits the continuous observation of the extent of penetration by means of a photoelectric cell, which indicates on a microammeter increasing light transmittances as penetration proceeds in the sample. Provision is made for maintaining penetrant and sample at a temperature constant to 0.1 deg. C., which is important in eliminating errors introduced by variations in viscosity of the penetrant due to temperature changes. As many transmittance readings as desired are made at predetermined intervals over a fifteen-minute period. To yield readings of maximum precision with various types of paper, penetrants of various viscosities are used. Viscosities range from 1/10 to over 80 poises, the thinner penetrants being used for resistant samples and the thicker for absorbent samples. They are prepared by dissolving a synthetic resin (polyvinyl acetate) in a nonvolatile solvent (diethyl phthalate), the viscosity of the solution depending on the concentration. These very stable penetrants are standardized by determining both absolute viscosity and surface tension.

Transmittance readings are plotted by a system which was developed to give curves as nearly linear as possible, yet which are entirely independent of viscosity, so that, when penetrants of different viscosities are employed, the results are strictly comparable. When the slopes of the linear portions of the penetration curves (plotted on a standard basis) are expressed as tangents, a characteristic numerical index of permeability is obtained.

Aqueous penetrants were prepared by dissolving polyvinyl alcohol in water. These gave abnormal results in that, after plotting, no linearity could be established, indicating that aqueous solutions do not obey the so-called sizing formula, which stipulates a fixed pore radius. Under the influence of water the swelling of the fibers causes a continuous diminution of the port radius particularly at the surface.

Since the photoelectric cell is not equally responsive to all wave lengths of light, special precautions must be taken with colored papers. It was found that by completely transparentizing (with diethyl phthalate) a portion of the sample to be tested, a filter could be prepared which, when inserted in the path of the light source, gave light of the same chromatic composition as would be transmitted by the sample under test. Results with this method were shown to be fairly precise providing the colors were not intense.

The instrument and method have certain limitations. It was primarily designed for research and not control work. It is obviously essential that there should be a reasonable increase in transmittance of the sample as penetration proceeds. Hence, the method is unsuited to glassines, greaseproofs, intensely colored wrappings and covers, boards, etc. However, for bonds, tissues, general printing papers, etc., the method is felt to be capable of greater precision and dependability than has heretofore been possible.

A Study of the Relation Between Sheet Strength and Fiber Surface Conditions[1]

HENRY PHILIP DIXSON, JR.[2]

A large number of surface-active compounds have come into industrial use recently as wetting agents, emulsifiers, detergents, and penetrants. These compounds have been used in the pulp industry to shorten the reduction time of hard-sized broke, to assist in deinking old papers, and to aid in processing latex and absorbent papers.

(1) A portion of a thesis presented in partial fulfillment of the requirements of The Institute of Paper Chemistry for the degree of Doctor of Philosophy from Lawrence College, Appleton, Wis., June, 1939.
(2) Fox River Paper Corporation, Appleton, Wis.

Since surface-active compounds, even in very dilute solution, reduce the surface tension of water and cause very rapid penetration of water into textiles, it would seem worth while to investigate the effect of such agents upon the beater processing of pulp. The beating and sheet making processes are chiefly concerned with the cellulose-water relationship and, in spite of a large number of investigations, the change in cellulose-water systems during beating and sheet formation is not very well understood.

Broadly speaking, there have been three concepts of hydration: (1) the chemical, (2) the physical, and (3) the physicochemical or colloidal. The first two generally have been discarded by such investigators as Harrison, Campbell, Bell, and Kress and Bialkowsky. The physicochemical theory held by Harrison, Campbell, Bell, Cottrall and Clarke involves fibrillation as one of the chief factors causing strength in paper, but it also includes a mechanism of fiber-fiber bonding.

It is apparent that there must be a close relation between the condition and amount of water retained on fiber surfaces and the sheet-forming characteristics of these fibers. Experiments have been carried out employing variable surface tension conditions, and variations of the hydrophilic character of pulp fiber surfaces by the use of surface tension depressants and several highly hydrophilic colloids. The effects of these variations on pulp fiber surface characteristics and upon sheet formation have been observed and are reported below.

Ball mill evaluations of pulp in the presence of wetting agents were made, in which 2 grams of the desired wetting agent were added to each charge. After the milling period, half of the pulp was very thoroughly washed. Sheets were made from the pulp still containing the wetting agents and from the washed pulps. The results of this procedure for Duponol WA and Onyxsan S are shown in illustration (Figure 1*). It was noted that the chief cause of a reduction in strength was due to the presence of the surface-active material during sheet formation and drying. The great difference between Duponol WA and Onyxsan S is due to their colloidal nature. Onyxsan S has a positive potential and cellulose has a negative charge, but Duponol WA is negative, as are most surface-active agents. Thus Onyxsan S would be much more strongly sorbed on cellulose than Duponol WA.

In all pulps treated with wetting agents, the equilibrium moisture content was found to be slightly but persistently lower. In another experiment sheets were made from pulp beaten 75 minutes and treated with Duponol WA (0.3 gram per sheet). These sheets were wet pressed until the solid fraction (i. e., concentration of fibers per unit volume) was identical to that of the untreated sheets. Even when the low surface tension conditions of the sheets treated with wetting agent were supplanted by mechanical pressure, the physical characteristics of the sheet did not return to normal. The presence of wetting-agent, molecules, as well as surface tension effects, must be responsible for the loss of strength.

Since wetting agents have been shown to decrease the hydrophilic nature of pulp, studies were undertaken in which the hydrophilic character of pulp was increased by the addition of several hydrophilic materials. It was assumed that these materials coated the fibers and thus produced a more hydrophilic surface. Gelatin, locust bean gum, and a cellulose gel were selected as the hydrophilic colloids. These materials were compared with Duponol WA in their effect on pulp fibers.

The hydrophilic materials were added to unbeaten bleached sulphite pulp at 0.9 per cent consistency in a quantity of 0.15 gram per sheet and stirred for 1 hour. Since Duponol WA is only 50 per cent sodium lauryl sulphate, 0.3 gram per sheet was employed.

The conclusion may be drawn that the ability of pulp fibers to form fiber-fiber bonds is dependent upon the hydrophilic character of the fiber surface. This concept is supported by Campbell. He pointed out that the surface of cellulose must be in solution or rather the surface molecules must be continually dissolving and others redepositing on the cellulose.

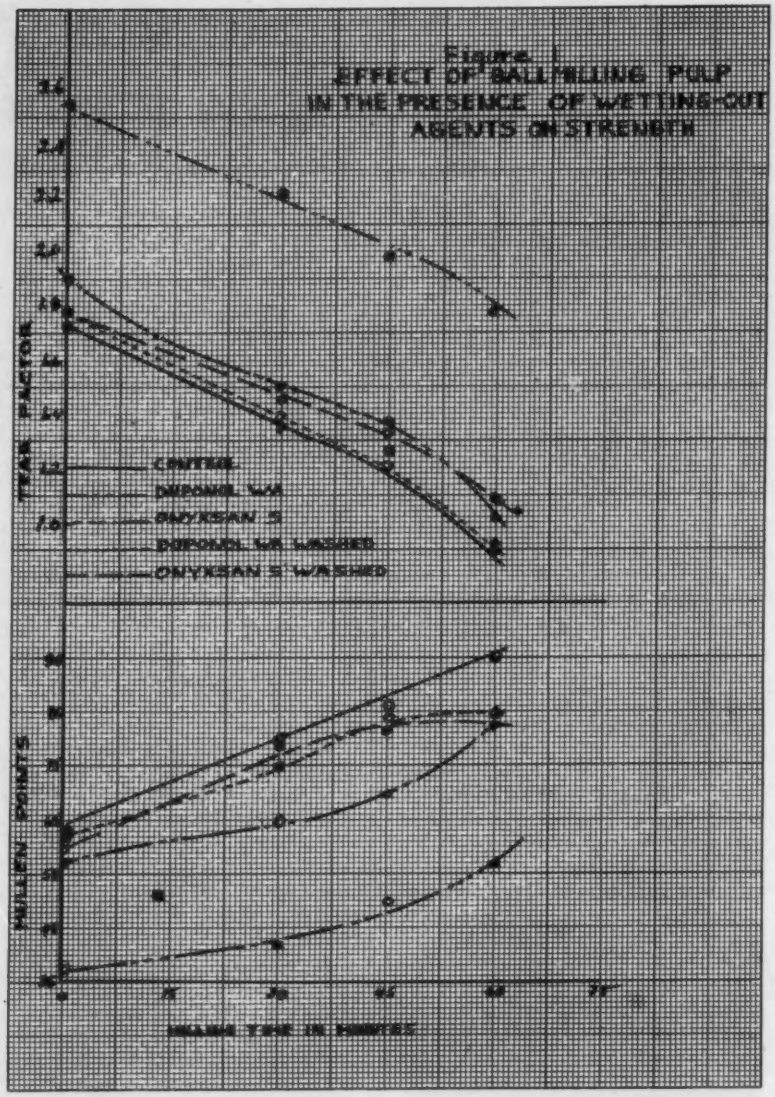
EFFECT OF BALL MILLING PULP IN THE PRESENCE OF WETTING-OUT AGENTS ON STRENGTH
CONTROL
DUPONOL WA
ONYXSAN S
DUPONOL WA WASHED
ONYXSAN S WASHED

Figure 1

Materials vary in respect to their ability to bind water at their surfaces. If cellulose is coated with materials which bind water more strongly than cellulose, the active layer will be much thicker. Thus, more fiber-fiber bonds will form when fibers are brought close to each other than would ordinarily form without the thickened active layer of hydrated material.

The hydrophilic character of pulps vary to a great extent because they contain varying amounts of hemicelluloses which are extremely hydrophilic. Generally speaking, the more a pulp is purified, the less hydrophilic it becomes. This is demonstrated by the increased amount of beating necessary to produce a given strength. It is not to be implied that pure cellulose is not hydrophilic; in fact, it is extremely so; but cellulose fiber differs from other gels in that the macromolecules are bound in a rigid structure as fiber walls. In the non-fibrous gel state, cellulose shows relatively high hydrophilic character but it is not comparable to hemicellulose.

It may be concluded that, for a given fiber furnish in a pulp-processing apparatus,

(*) The complete presentation of this paper included six figures.

the tearing strength is inversely proportional to the bursting strength and an increase in this strength will be attended by a proportional loss in tearing strength. In other words, the tearing strength is inversely proportional to the fiber-fiber bonding above a certain small degree of fiber bonding essential to hold the sheet together.

Bleached sulphite pulp was mordanted with tannic acid to make it less hydrophilic. Tannic acid is well known as a dehydrating agent in colloidal systems. Sheets made from these fibers were compared with sheets treated with Duponol WA, locust bean gum, gelatin, and methyl-cellulose. Strength characteristics and alkali-binding power were compared. The alkali binding of tannic acid-treated fibers could not be measured due to the high acidity.

The sheets made from tannic acid-mordanted fibers were merely a felted mass. The fibers could be brushed from the sheet by hand. The alkali binding of the shredded handsheets showed a trend of hydrophilic character consistent with the hypotheses advanced. The binding power of the gelatin-treated sheets was too high; however, on rewetting the dried handsheets, the colloidal materials will not revert to their original hydrated state. This is especially true of methyl-cellulose which must be prepared in an alkaline medium.

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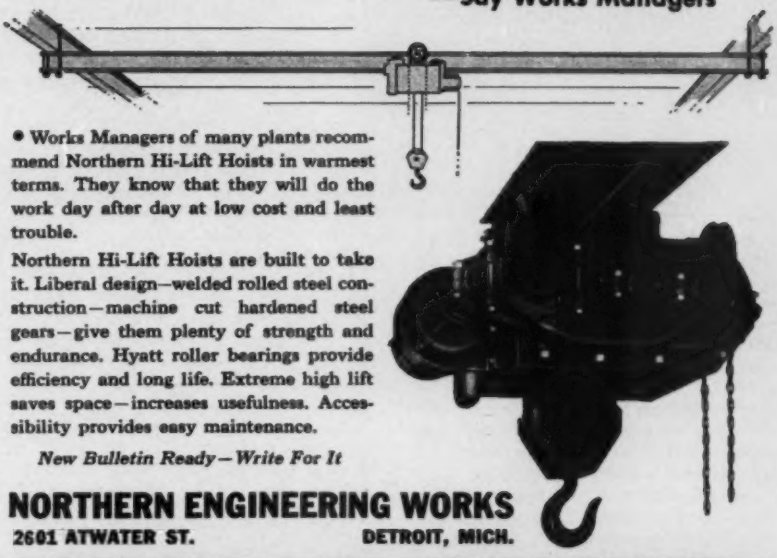

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The Application of Synthetic Salt Cake to the Kraft Pulp Process

WALTER L. SAVELL,
Manager Technical Division,
The Mathieson Alkali Works, (Inc.)

The product that has come to be known as synthetic salt cake is essentially a sintered composition of sulphur and soda ash. It is a grey, granular, non-hygroscopic material weighing 80 to 83 pounds per cubic foot.

In the preparation of synethic salt cake the mixing of the sulphur with the soda ash is carried on so that each particle of the latter takes on a quota of sulphur making it a chemical unit ready for reaction. A secondary effect of the method of preparation is to give a large measure of protection of the alkali against moisture absorption from the air since each particle presents a practically moistureproof surface of sulphur to the atmosphere.

There is a very practical advantage in this condition since it very materially reduces the tendency of the synthetic salt cake to form lumps or to cake in storage.

There is also a chemical advantage in the intimate physical combination of the sulphur and soda ash. Separation and segragation of the components are impossible so ideal conditions are presented for immediate reaction of the two when the proper temperature is reached.

The first large scale application of synthetic salt cake was conducted in a Babcock and Wilcox Tomlinson recovery unit. In this case the synthetic salt cake was fed into the black liquor in exactly the same way that sodium sulphate was normally fed.

The synthetic salt cake was delivered in box cars. Unloading was done by hand by means of shovels and wheelbarrows. Each barrowload was weighed and dumped into the boot of an elevator. From the elevator it dropped to a hammer mill and thence to a screen and thence to a pneumatic conveyor system which delivered it to the bins in front of the furnace. From these bins it dropped to the short automatic belt conveyor feeders which in turn dropped it into the dissolving tanks through which black liquor circulates and was thus delivered in the black liquor to the furnace spray nozzles.

One of the troubles experienced in the early runs was due to the fact that an occasional piece of tramp iron would go through the system with the synthetic salt cake. Several times sparks resulting from the iron passing through the grinder caused the ignition of sulphur dust and flash fires. These fires extinguished themselves when the grinder or feed was stopped so they were never serious. It was also noted that a considerable amount of dust was formed by the grinding of the synthetic salt cake and this dust was carried over into the Connorsville type blower used to operate the conveying system. In the blower the dust built up a cake that eventually created excessive friction and caused a shut down. To remedy the latter condition a filter was installed between the cyclone separator and the blower.

An improvement in the properties of the synthetic salt cake made it unnecessary to grind it prior to screening so the hammer mill was not operated when this material was fed. It, therefore, by-passed the grinder onto the screen and then to the pneumatic conveyor in the usual manner. Incidentally, the improved synethic salt cake eliminated the dust problem so the air filter is no longer necessary.

Ten cars of synthetic salt cake were sufficient to make a complete replacement of all the chemicals in the system. Although a fairly high sulphidity was maintained in the white liquor throughout a ten-car run, it dropped from 29.0 per cent to 27.25 per cent. This drop would have been considerably greater, had it not been for the fact that a portion of the sulphur dixoide formed was caught and returned by the heavy black liquor used in the scrubbing tower.

A measurable amount of evaporation occurs in the scrubber so it accomplishes both economy of heat and chemicals.

In another mill, a test run wit ha Babcock and Wilcox Tomlinson recovery unit showed that it was easily possible to drop the normal sulphidity from 28 per cent down to 22 per cent in a system not equipped to scrub sulphur dioxide from the gases and return it to the furnace. The higher losses were evident in the stack gas analysis as well as in the analysis of the smelt and white liquor.

In two other mills synthetic salt cake was applied by air injection in a continuous flow. More than 1,000 tons were used in this manner. The results obtained in both mills indicated a loss of sulphur by direct burning from the surface of the coated particles of soda ash. The loss in such application amounted to 10 per cent to 30 per cent of the total sulphur con-

tent. White liquor sulphidities dropped as much as 3.5 per cent to 4 per cent.

To obtain optimum results in the application of synthetic salt cake it is necessary to feed it in a manner that will prevent contact with air (oxygen) and high temperature conditions simultaneously. It is also necessary to prevent mixing with organic material such as black liquor or black ash before reaching a temperature of about 300 deg. C.

Inasmuch as the major portion of the sodium sulphide is formed by self reaction, in other words, by the action of the sulphur itself, it is not necessary for the synthetic salt cake to be in immediate contact with a reducing agent when first introduced into the furnace. For this reason, it is preferable to feed it in a manner that will allow it to pile upon itself in the reducing zone of the furnace. The very liquid smelt which results then runs down over the carbon of the black ash and the reduction of the sodium sulphite, etc., takes place as the smelt moves to the discharge spout.

Intermittent feeding gives results which are often better than those obtained with continuous feeding. Mechanical feeders for both methods have been designed.

Hand feeding with a shovel at intervals of 15 to 30 minutes gives excellent results, in any recovery furnace. Any mechanical feeder which duplicates this type of delivery of the synthetic salt cake into the furnace is equally satisfactory.

Synthetic salt cake is now being applied in all of the various types of recovery units installed in kraft mills of the South. These include Babcock & Wilcox Tomlinson recovery units, the Carey furnace, the Goodell, Wagner, and the so-called Swedish recovery unit.

By making a choice of the appropriate method of feeding, a chemical efficiency can be obtained with synthetic salt cake that is better than the best so far obtainable with sodium sulphate (ordinary salt cake).

The study and investigation of the product was started nine years ago. In December, 1938, pilot plant production was started. In January, 1939, the first mill scale runs were made in a kraft mill. Today synthetic salt cake is in wide use in the mills of the Gulf area.

In closing, the author wishes to acknowledge the enthusiastic assistance rendered during the early stages of development by W. F. Gillespie, technical director, and his staff at the Bogalusa, Louisiana, plant of the Gaylord Container Corporation. Also he wishes to thank Robert Fuller, chief chemist of the Gulf States Paper Company, Tuscaloosa, Alabama, for the study of thermal conditions surrounding the various reactions involved in the application of synthetic salt cake. William Ebersole, chief chemist of the St. Joe Paper Company, Port St. Joe, Florida, has also given valuable assistance in our study of methods of application.

Sulphate Pulping of Douglas Fir: Effect of Growth Variables on Yield and Pulp Quality. III*

MARK W. BRAY, Senior Chemist
SIDNEY L. SCHWARTZ, Assistant Engr.
and
J. STANLEY MARTIN, Associate Engr.
Forest Products Laboratory,[1] Forest Service, U. S. Department of Agriculture

The wood selected for the pulping experiments consisted of rapid and slow-growth material from both young and old-growth stands of Douglas fir *(Pseudotsuga taxifolia)* growing in Washington and Oregon. The shipment, No. 1466, consisting of wood from four trees and amounting to approximately 5 cords, was selected by the Pacific Northwest Forest and Range Experiment Station. The four trees in the shipment were representative of four types of growth rate, namely, rapid and slow old-growth and rapid and slow young-growth respectively.

Chips prepared from the upper, middle and butt portions of each tree were cooked in a solution containing a total of 20 per cent of their oven-dry weight of caustic soda and sodium sulphide in the ratio of two parts of the former to one part of the latter, making the total sodium oxide content of the liquors equal to 15.6 per cent. The digestions were made in triplicate, in spherical steam-jacketed autoclaves of 3.7 gallons capacity. A cooking schedule of three hours was followed—1½ hours linear temperature to maximum temperature and 1½ hours at the maximum temperature of 170 deg. C.

The high cellulose content of the young-growth Douglas fir wood of both the rapid and slow-growth classes is reflected in the higher yields of pulp obtained from this type than is obtained from the lower cellulose-containing old-growth material. On a weight basis, the difference in yield of oven-dry, screened pulp from these two classes of wood was in excess of 4 per cent. These differences in yield neither appear to be dependent upon rate of growth nor upon the location of the bolt in the tree, but rather upon the relative age of the tree, as the highest yields were obtained from the young-growth material. It is of interest to note that the average weight yield of screened pulp obtained from all top bolts, all middle bolts, and all butt bolts is practically the same.

In considering yields on a volume basis, which takes into consideration the density of the raw material, the lowest yield of screened pulp was obtained from the old slow-growth trees, all other types of growth giving approximately the same average values. In addition, the average yield of screened pulp per cubic foot of solid wood showed a progressive decrease as samples were selected from the butt to the top of the trees. The highest percentage of rejections was obtained from the butt logs of the young rapid-growth material and the lowest from middle and butt logs of the old rapid-growth wood.

The percentage of chemicals consumed varied from 85.4 to 90 per cent of the total chemicals charged, or from 17 to 18 per cent of the oven-dry weight of wood charged.

Density of the spent liquors was slightly lower for the young-growth material than for the old-growth types. The average heat value of the spent liquors was 6792 B.t.u. per pound of oven-dry residue, a value quite in accord with that for the southern yellow pines.

The cellulose content of the pulps varied from 90.5 to 94.0 per cent, averaging 92.7 per cent, with no trends observable so far as springwood content, growth rate, or position of bolt in the tree are concerned. The pulps from the young slow-growth and the old rapid-growth were the highest in both total and alpha cellulose, while that from the old slow-growth wood gave the lowest values for total and alpha cellulose and the highest lignin content and chlorine numbers. The pulps containing the highest percentage of pentosans were obtained from the old rapid-growth material. There appeared to be no relationship between heartwood content and bleach requirement.

Pulps from the top bolts were practically always higher in bursting and tensile strength and lower in tearing strength than those selected from lower portions of the trees, but in many instances the trends in physical properties were more erratic for the Douglas fir pulps prepared from middle and butt portions of the several growth types than were observed in the case of the southern pines. Except for young, rapid-growth material, which gave intermediate values, pulps prepared from top logs were higher in solid fraction or density of sheet than those made from logs lower down in the tree.

(*) The first two articles in this series are entitled, "Sulphate Pulping of Southern Yellow Pine: I, Effect of Growth Variables on Yield and Pulp Quality," by M. W. Bray and C. E. Curran, *Paper Trade J. 105*, (20), 309 (November 11, 1937). II, M. W. Bray, J. S. Martin, and S. L. Schwartz, *Southern Pulp and Paper J.* 2, (6) 35 (November, 1939).

(1) Maintained at Madison, Wis., in co-operation with the University of Wisconsin.

Bending Tests of Corrugated Board and Their Significance

T. A. CARLSON, Senior Engineer
Forest Products Laboratory,[1] Forest Service, U. S. Department of Agriculture

During the past few years considerable progress has been made in the development of a number of new or improved methods of testing fiberboard. One of the tests that has recently received increased attention is the static bending or beam test. As this test makes possible the use of well-known engineering principles to determine strength properties of corrugated boards, its use should be encouraged.

Elaborate equipment is not needed. Simple methods of making tests have been employed by different laboratories through adaptation of equipment already available.

Static bending tests made by any of the various methods should provide useful information about corrugated board, but there are certain influences that should be taken into consideration in order to get the most value from the test, particularly if it is desired to compare results from different laboratories.

(1) Maintained at Madison, Wis., in co-operation with the University of Wisconsin.

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The purpose of this article is to discuss two of the important factors that influence the results of bending tests, namely, span-depth artio and overhang.

In the conventional beam formula for center loading the modulus of elasticity E is given by the expression:

$$E = \frac{PL^3}{48IA}$$

in which P is the applied load, L is the span (distance between supports), I is the moment of inertia of the cross section, and A is the deflection of the beam at the center. For comparing beams of a given cross section, use is often made of a stiffness factor (EI) to show relative stiffness or rigidity. This factor has been found to provide a convenient means of studying the stiffness of corrugated board. As E is a property of the material and as I is a function of the dimensions, the stiffness factor EI would be expected to have a constant value regardless of the span for specimens of any given direction of flute with respect to the direction of the span. Actually, however, some of the deflection that occurs is due to shear distortion.

In order to obtain a true picture of the relative portion of the deflection contributed by shear and by true bending it is necessary to resort to a more recent formula. For this purpose the Forest Products Laboratory used the following formula (National Advisory Committee for Aeronautics, Tech. Report 180, 1924):

$$A = \frac{PL^3}{48EI} + \frac{KPL}{F}$$

The notation is the same as in the first formula with the addition of F, which is the shear modulus, and K, which is a constant depending on the shape of the beam and the manner of loading. In this formula the first term on the right-hand side represents the deflection due to tension and compression and the second term represents the deflection due to shear.

When corrugations are parallel to the length of beam the amount of deflection due to shear is small and for spans greater than 10 or 12 inches could in general be neglected. However, when the corrugations are perpendicular to the length, the amount of shear deformation assumes greater proportions. In spans of 5 inches or under it is equal to or greater than the deflection due to tension and compression of the facings.

As the amount of shear distortion becomes less with an increase in span, it would appear possible to determine the stiffness of the liners in a piece of corrugated board by making a test over a span of such length that shear would not be an appreciable factor. For board with corrugations parallel to the length such a test over a span of 12 inches or more should give a good approximation. However, for board with corrugations perpendicular to the length the size of the specimen necessary for such a test would generally be beyond such convenient limits.

The length of span as previously mentioned is the distance between supports. The length of span thus does not include the overhang, which is the part of the beam that must necessarily extend beyond the supports in making the tests. The actual over-all lengths of specimens tested were in each instance 1 inch greater than the span. This provided an overhang of one-half inch at end end of the beam. The effect of varying the overhang was studied by means of bending tests over 2 and 4-inch spans in which different ratios of total length to span lengths were used.

The material for these tests consisted of a double-faced corrugated board made from 0.016-inch cylinder kraft liners and 0.009-inch straw paper.

The conclusion to be drawn from the study of overhang is that in making comparisons on the basis of bending tests of corrugated board consideration should be given to the amount of overhang and its relation to the span. In bending tests over short spans where the shear deformation is an important factor, a given amount of overhang would have a greater effect on the results that it would in tests over longer spans where the shear deformation is less of a factor. The ½-inch overhang used in the tests at the Forest Products Laboratory was used partly on the findings of the tests discussed here and partly on practical considerations. In addition, a bearing plate about ⅜ inch wide was used on each support and also under the bearing block at the center. Such plates help to avoid local bending or crushing between the tips of the flutes both at the center and at the end supports so that the deflection measurements represent more accurately the bending of the specimen as a whole. As a further precaution against bending that may occur at the ends, it is suggested that specimens for test be cut either with a sharp powersaw or with a razor blade or other sharp instrument. The use of shears for this purpose is believed to cause incipient bending at the ends of the specimens that may affect the results.

Germination of Bacterial Spores

ROBERT S BREED
New York State Experiment Station, Geneva, N. Y.

During the manufacture of paper and paperboard, all except heat-resistant and dryness resistant types of bacteria and killed as the sheet passes over the dryer rolls. Perhaps the most common bacteria to survive are spore-forming, rod-shaped types assigned by bacteriologists to the genus *Bacillus*. These undoubtedly persist in paper products as spores rather than as vegetative cells, the latter ordinarily being killed at temperatures of 160 deg. Fahr. for 30 seconds.

The spore-forming bacteria that are normally present in paper products are found practically everywhere. Living, as they do in soil, the spores blow about in dust and so are present in the water of streams and lakes. These bacteria find the food materials present in pulp suspensions adequate for growth and, in the spore con-

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dition, are difficult to kill by chlorination or other sterlization processes.

The film displayed (formal presentation consisted of the showing of movie film "Spore Germination of Bacteria" and of remarks concerning it—Editor's Note) was prepared about eight years ago by Professor S. Bayne-Jones, at that time on the faculty of the University of Rochester Medical School, in co-operation with the Eastman Kodak Company. It is an unusual film in that the pictures were made under high magnification and under conditions where it was difficult to get pictures of spores that were in process of germination.

Three kinds of spore-forming bacteria are shown in the film, *Bacillus subtilis, Bacillus cereus* and a form related to the latter type. The first of these is sometimes called the hay bacillus as it was found by Cohn in 1875 in hay infusions and the spores attracted his attention because they were not killed by boiling in water for an hour.

The spores of *Bacillus subtilis* germinate equatorially, that is, the new, young cells grow out at the equator of the oval spore with the long axis of the new cell at right angles to the axis of the spore. The spores of the second bacillus shown germinate by stretching. That is to say, that in forming the new cell, the interior protoplasm elongates in the long axis of the spore, rupturing the spore wall at the equator. This leaves caps composed of the old spore wall on either end of the new cell. The spores of *Bacillus cereus* show polar germination. That is, the new cell pushes through one end of the oval spore wall. This leaves the old spore coat on one end of the new cell. As the new cell elongates, the old spore coat slips off of the end of the new cell. These old, empty spore-coats may then be seen lying among the new vegetative cells.

Drying Rates for Pulp

L. G. GREEN, Chief Engineer
A.P.W. Paper Company

By use of a questionnaire survey, drying rates have been established for pulp in a manner similar to that done in the past for various classes of paper.

In all reports drying rate has been defined as the pounds of paper or pulp dried (Rp) or pounds of water evaporated (Rw) per hour per square foot of total drier surface covered by the width of the sheet.

The illustrations (Figures 1 and 2*) show the drying rate for pulp. On Figure 1 the production drying rate is shown in pounds of pulp dried per hour per square foot plotted against both steam temperature and pressure. Figure 2 shows the evaporation drying rate plotted in the same manner.

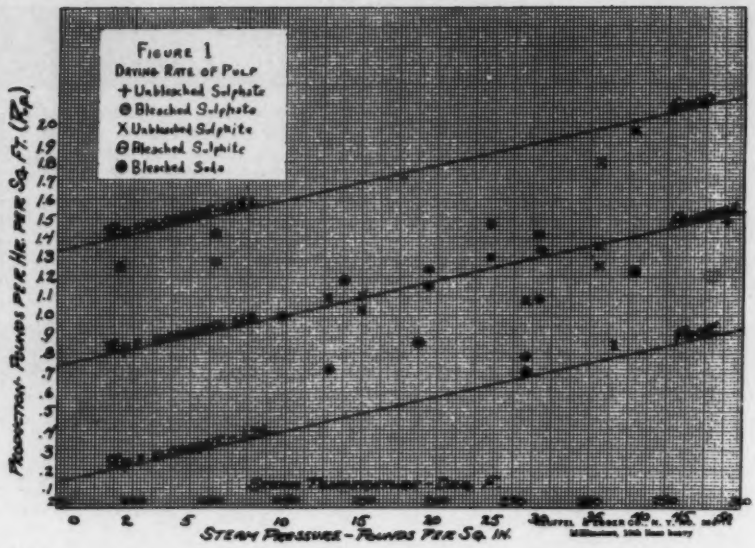
It is assumed that the drying rates are a straight line function of the steam temperature. This may not be exactly true, but it is sufficiently accurate for our purposes and the extent and variation of the data does not justify an attempt to determine a curve.

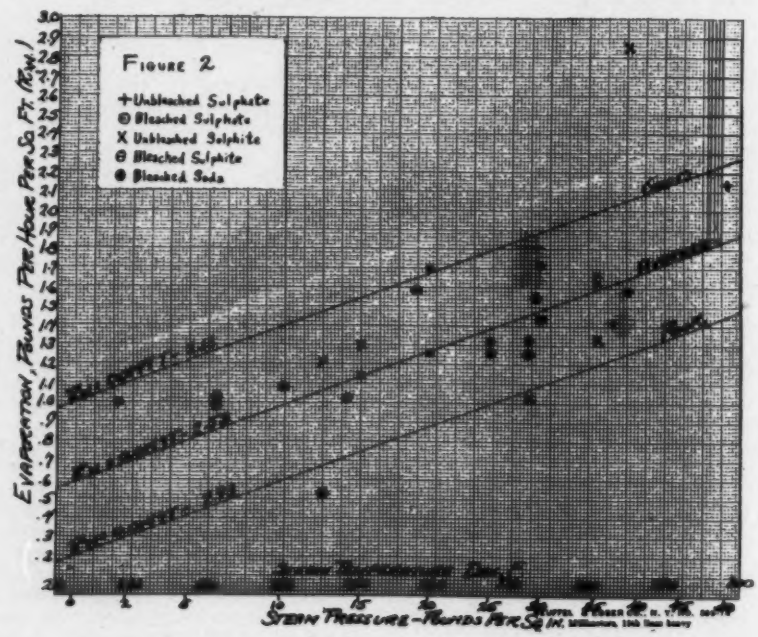
The drying rates on Figures 1 and 2 may be represented by the following formulas:

(5) $Rp = 0.00888T - C$

(6) $Rw = 0.0147T - C$

(*) The complete presentation of this paper included six figures.





Where Rp = lb. of paper dried per hour per square foot of drying surface.

Rw = lb. of water evaporated per hour per square foot of drying surface.

T = Steam temperature in deg. Fahr. of steam at saturation at pressure in dryers.

C = A constant for the particular machine and type of product.

The chief value of the formula is that it permits of correcting the drying rates for comparison with other variables holding steam pressure constant. It is assumed that as the drying rate of the average machine varies with the steam pressure in accordance with the formula that any one machine would vary in the same way.

By derivation as developed by Montgomery it is possible to correct any observed drying rate at the observed steam temperature to a standard steam pressure and temperature. This is taken arbitrarily at 15 lb. and 250 deg. Fahr.

The formulas for pulp then become:

(7) Rp(std) = Rp(observed) — 2.2 — 0.00888T(observed)

(8) Rw(std) = Rw(observed) — 3.68 — 0.0147T(observed)

On the average, for a given steam pressure, the caliper or weight of pulp has no marked effect on the drying rate.

Drying rates are less on long machines than on short ones. This is more noticeable on the production rate Rp than it is on the evaporation rate Rw. A further study of the length of machine versus pressures, total water evaporated, and per cent dryness going to dryers reveals that there is very little difference in the group of machines having an S/W of less than 60 and those having an S/W of 60-120.

No conclusions could be made on effect on final moisture content as most of the machines reporting had a final moisture content very close to the average of all data

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(83 per cent oven dry). The average moisture removal of all data was only 1.18 lbs. water per lb. pulp but considerable variation on individual machines from this figure was noted. Per cent dryness going to dryers varied fairly widely relatively.

The preponderance of returns were for unbleached and bleached sulphite. The average corrected Rp for all data was 1.10. Several mills commented that the higher bleaching pulps were harder to dry than easy bleaching. The average Rw corrected for all grade was 1.22.

The fourdrinier machines reported a higher average dryness going to dryers than the cylinder machines—43.3 per cent dry versus 37 per cent dry.

A factor generally realized as having much effect on the drying rate is the ventilation between the dryers. The average Rw or evaporation rate was 1.24 for machines with nozzles and 1.19 for machines without nozzles.

Conclusion cannot be made on the effect of felts on the drying rates.

Included in the data returned were the drying rates for two vacuum type dryer machines. This data was not used in establishing the drying rates but as a matter of interest it is commented on. The average corrected evaporation drying rates for the two machines show a 25 per cent greater rate than the highest individual machine reported above and better than twice as high as the average of all machines.

The condition of dryer drainage, type and amount of ventilation in and around the hood and condition of dryer surface inside and outside, are important factors. These account, probably, for the variation of drying rates at any given steam pressure.

Comments on the returned questionnaires state that the following affect the drying rate:

Hot water showers or increasing pulp temperature before the presses (effect on dryness going to dryers?); bleachability of pulp (best rate for low bleachability); temperature of air in hood in cold weather; less efficient pressing in cold weather (temperature of pulp); and in one case, excessive dryer temperature was reported to decrease drying rate.

Water Treatment Plant for the Fernandina Division of Rayonier Incorporated

ESKELL NORDELL[1] and
CHARLES E. RICHHEIMER[2]

The Fernandina Division of Rayonier, Incorporated, is of particular interest, as it is the first mill for the manufacture of rayon pulp from slash pine to be constructed in the South. This mill is located at Fernandina on the northeastern coast of Florida.

Detailed investigations of all possible sources of raw water and necessary treatments, therefore, indicated that deep artesian wells, extending into the underlying limestone aquifer, would be the best source of raw water for the mill, as the presence of sea water near the mill site allowed the engineers to call upon previous experience and design an entirely automatic zeolite treatment, sea water regenerated, water softening plant.

The artesian well water is clear and colorless. It contains, however, about 3.6 p. p. m. of hydrogen sulphide, and has a hardness content of about 340 p. p. m. or 20 grains per U. S. gallon.

Extensive field experiments (carried out by one of the co-authors—Eskel Nordell—assisted by F. V. Ryder) proved that satisfactory reduction of the hydrogen sulphide content could be obtained by means of a two-chambered degasifier, which used flue gas in a closed upper chamber and air in an open lower chamber.

(1) The Permutit Co., (2) G. A. Youngberg & Associates, consulting engineers.

The 30,000,000 gallon per day two-chambered degasifier, used for removing the hydrogen sulphide from all of the water used in the mill, was designed from the data obtained by this field work. The flue gas, used in this process, is obtained from the boiler breeching at the stack. It is first passed through a scrubber, filled with limestone, in which it is washed with sprays of water.

The automatic, sea water regenerated, zeolite water softening plant has a production capacity of 7,500,000 gallons of treated water per 24 hours. The overall cost of operation of this plant, using sea water to regenerate the zeolite units, is approximately $3.00 per million gallons of water treated.

The main zeolite plant consists of eight fully automatic, pressure type, vertical zeolite water softeners, supplied by The Permutit Company. Each unit is 14 ft. 0 in. in diameter by 14 ft. 0 in. in height in the straight side of the shell and is designed so that no ferrous metal comes in contact with the water.

These eight zeolite units are arranged in two batteries of four units each. Each unit is controlled by an individual control panel and each battery is equipped with a Bailey recording meter to act as a master control and to furnish a permanent record of the output of the plant.

The main zeolite plant is also arranged so that the two softener batteries start and stop synchronously with the raw water pumps whose operation is controlled, through Foxboro Level Controllers, by the level of the water in the soft water storage tanks.

The operation of the units in each battery are staggered so that, when one unit is being regenerated, the other three units of the battery are on the softening cycle. This method of operation plus the use of soft water storage, assures a constant supply of soft water.

P. A. PAULSON, Consulting Engineer
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ANALYSES OF RAW, DEGASIFIED AND SOFTENED WATER
Showing Changes in Hardness, H_2S and CO_2
(All results expressed in Parts Per Million)

	Raw	*Degasified*	*Softened*
Total Hardness as $CaCO_3$	312-340	312-340	0
Hydrogen Sulphide as H_2S	3.5-3.7	0.1-0.3	0
Carbon Dioxide as CO_2	8-20	9-13	9-13

The boiler feedwater is treated separately in a plant consisting of a lime pre-treatment plant, furnished by the International Filter Company, and an automatic battery of three Zeo-Karb softening units, furnished by The Permutit Company. The lime pre-treatment serves to reduce the bicarbonate hardness. The lime-treated water is then filtered and recarbonated and passed through the Zeo-Karb water softeners which serve to remove the remaining hardness.

As both the zeolite units in the main zeolite plant, and those in the boiler feedwater treatment plant are regenerated with saline water, the equipment having to do with this saline water is a very necessary part of both plants.

Bingham deep well turbine type pumps, in duplicate, are installed in the sea water intake structure. These pumps are trimmed with Ka_2SMo as a corrosion preventative measure.

A chlorinator and an alum feeder are installed in the sea water intake structure to deliver chlorine and alum to the suction of whichever sea water pump may be "on the line" (selection is at the option of the plant operator).

The saline water is pumped from the sea water intake structure to the sea water filters, through a 12 in. line consisting of Transite pipe hung under structures and cement-lined cast iron pipe laid in open terrain. This 12 in. line has a surge eliminator valve and accessories located in the intake structure to prevent line or joint breakage which might occur when the sea water pumps are suddenly started or stopped.

The saline water (with chlorine and alum added) is pumped to and through sea water filters (Permutit Company horizontal shell, pressure type) located at one end of the main zeolite plant building. After being filtered the saline water is used to regenerate the various zeolite units. An elevated sea water storage tank "floats" on the line after the filters and serves to maintain constant pressure as well as sufficient quantity of saline water to take care of the varying demands of the different softening units.

The sea water filters are entirely automatic in operation, the backwashing of any unit being accomplished with the filtered water from the other units. The automatic controls are similar to those used on the zeolite softening units. Furthermore, the sea water pumps and the sea water filters are interconnected through control circuits so as to automatically start and stop when the filtered saline water reaches certain predetermined levels in the sea water storage tank.

The Fernandina mill water treatment plants of Rayonier, Inc., were tested out and placed in normal service the latter part of November, 1939.

Microbiological Control in Pulp and Paper Manufacture

R. B. MARTIN and A. E. GRIFFIN
Technical Staff
Wallace & Tiernan Co., Inc.

Chlorination for microbiological control, although first used on drinking water supplies, has assumed a position of increasing prominence in the field of industry. Dairies, bottling plants, canneries and other food processing plants have found chlorine highly beneficial for the control of tastes and odors, conditioning of process waters and sterilization of plant equipment. Electric power generating stations employ chlorine for elimination of slime from condensers since efficient heat transfer is impaired by slime accumulations which are known to be of microbiological origin. Other similar uses for chlorine sterilization may be enumerated, among which is the control of microbiological growths in the pulp and paper industry.

Such slime formations which sometimes find their way into the plant through the fresh water supplied to the mill, may cause serious operating difficulties and impair the quality of the finished product. A number of different micro-organisms may be responsible for these slime growths. Organisms of the filamentous iron bacteria group, the algaes, certain of the fungi and various types of capsulated and non-capsulated bacteria may be responsible, and will influence the form of slime accumulation found. The environment found in the paper mill is suited to the development of most of these micro-organisms and their spread throughout the plant is extensive once they gain entrance. A fresh water supply, while a common source of infection, may not be the only source. Fibrous or non-fibrous paper-making materials supplied to the plant may bring this form of contamination to the mill.

Control measures at first were usually adequate and consisted of chlorination of fresh water supplied to the mill. With the increased use of recirculated white water additional complications were encountered and refinements in control measures were required to cope with the new problems presented. Chloramine treatment, which was not always necessary with the old open systems, in many cases proved adequate for bringing the white water problems under control. Chloramine treatment proved particularly effective in eliminating tastes and odors and in controlling after-growths in the distribution system. Because of the inherent nature of the chloramine treatment process, its use has been frequently employed for microbiological control in groundwood and newsprint papers, straw, kraft and similar paper products.

Substantial production improvements are to be realized from proper control measures. Improved quality in finished papers, elimination of slime spots and odors, and savings in production costs are some of these. The more stringent requirements imposed upon paper products to be used for food cartons and packaging have made the control of tastes and odors of vital importance. Particular attention must be paid to the choice and disposition of control measures to meet requirements of such food papers. A relatively new method of control which seems likely to prove particularly effective for this type of problem is stabilized chlorination of water. This means of sterilization employs high chlorine residuals with contact times sufficient to completely oxidize offending constituents in the water. In some cases this treatment must be followed by dechlorination.

Because of the different problems presented by individual mills, careful study of specific cases is advisable in order to determine the most efficient and effective method of microbiological control with particular reference to the quality of the final product and the use to which it will be put. Consideration of all such factors is essential in design of new white water systems or in changes in present methods of handling recirculated white water.

To assure maximum production benefits, sterilization efficiency should be maintained at all times in order to keep the contaminating organisms under control.

Some Observations on the Effect of Alum on Certain Sheet Properties

E. L. KELLER, Junior Chemist
F. A. SIMMONDS, Associate Chemist
and
P. K. BAIRD, Senior Chemist
Forest Products Laboratory,[1] Forest Service
U. S. Department of Agriculture

In the production of "point per pound" kraft wrapper and also bond paper from bleached sulphate pulps at the Forest Products Laboratory, serious strength losses occurred when the furnishes were sized with rosin. Test sheets made from the same furnishes also showed a drop in strength. When, however, unsized furnishes of the bleached kraft pulps were put over the machine there was no difficulty in even exceeding a bursting strength standard of a point per pound per ream on a 25x40-500 basis.

In order to determine if the loss in sheet strength was due to the H-ion concentration, equivalent to pH 4.5, at which the rosin size was precipitated and the furnish run on the machine, a series of test sheets were made using various combinations of size and alum and also process water.

These tests showed that even when alum only was added to the kraft furnishes made with both hard and zeolite softened water, a loss in sheet strength resulted, apparently depending on the amount of alum added. For example, the addition of enough alum to yield a pH of 4.5 caused a 25 per cent loss in bursting strength with reference to the waterleaf sheet.

(1) Maintained at Madison, Wis., in cooperation with the University of Wisconsin.

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In addition, the results established the fact that only a negligible further strength loss occurred when both size and alum were added to the furnish. It was, therefore, indicated that the cause was confined to reactions occurring in the pulp-water-alum system.

The use of distilled water as a process water, with the purpose of factoring out possible effects of those soluble constituents in natural waters, showed that the addition of sufficient alum to a furnish at the consistence obtaining in the deckle box of the sheet machine (0.05 per cent) to yield a pH of 4.5 could cause as much as a 50 per cent reduction in bursting strength. If, however, the pH was adjusted to 4.5 at a consistence of 3 per cent with alum and then no more alum added to the suspension in the deckle box, the sheet strength was not lowered. Yet this latter amount of alum when applied in the presence of either hard or soft water resulted in a measurable strength loss.

The obvious possible causes of strength loss suggested by the foregoing results were: the alum, the degree of acidity due to the hydrolysis of the alum, the combined effect of the alum and the dissolved components of the process water, or combinations of these factors.

For purposes of comparison a brief survey was made of the alkalinity of mill process waters, both raw and treated, at various points in the Wisconsin papermaking area. These data illustrate clearly the exceptionally high alkalinity of Madison well water and softened waters used in the experimental paper mill at the Forest Products Laboratory.

The values for the ash contents of the sheets prepared with alum and also with alum plus other furnish components show the mineral content was increased about five times. It was, therefore, indicated that the retained floc was most likely the cause of the observed strength changes, with the acid introduced in the systems by the alum as either an alternative or supplementary cause.

The possible effect of acid at pH 4.5 on strength was found, in general, to be negligible. As pH values are decreased with the addition of greater amounts of acid, deleterious effects on strength occur which appear due entirely to acid. It is obvious, of course, that given a sufficiently high concentration of acid the cellulose itself would be destroyed.

Since it is always important to know if results obtained with test sheets are applicable to machine-made papers, two machine runs were made with bleached sulphate pulp furnishes. One of these was made with untreated softened water and the other with bicarbonate-free softened water. The bicarbonate radical of the sodium bicarbonate present in the softened water was removed by adding sulphuric acid to produce a pH of 4 and then agitating the water for an hour in order to complete the decomposition of the carbonic acid. The pH of the water was then adjusted with sodium hydroxide to approximately 7.

To each furnish were added 1 per cent Titanox, 1.1 per cent rosin size, and sufficient alum to lower the pH to 4.5 at a consistence of about 2 per cent. The furnish made with water free from bicarbonates required 2 per cent alum and the other, 3 per cent. When the alkalinity of the softened water containing bicarbonates was calculated as a weight of calcium carbonate, as is customary, this amount was about 2 per cent of the weight of the pulp used in the furnish.

Both furnishes were run on the paper machine at a pH of 4.5. The properties of the resultant papers were, in general, in accord with those of the test sheets. For example, the folding strength and ash content of the paper made with the process water containing bicarbonates were 254 double folds and 2.3 per cent, respectively. Corresponding values for the paper made with bicarbonate-free process water were 452 and 1.5 per cent, respectively.

It appears that as the bicarbonate content (alkalinity) of the fresh water used in a particular furnish increases, thus necessitating an increase in the amount of alum added to maintain a constant pH value of 4.5, the amount of floc formed and retained by the paper increases.

Aside from alum-alkali reactions, it was indicated that relatively large amounts of alum alone, such as might be present in white water, when added to a furnish has a deleterious effect on sheet strength.

In instances of unexplained strength losses in mill operation it is suggested that the possibility of the factors enumerated herein being the cause should be examined.

NAMES *in the* NEWS

Personals

RELIANCE ELEC. APPOINTS COREY SALES V. PRES.

Since 1932 general sales manager of the Reliance Electric and Engineering Company, Cleveland, Ohio, James W. Corey is now sales vice president of the company. He was elected to the

James W. Corey

executive position at a meeting of the board of directors held March 21.

Mr. Corey became associated with the Cleveland firm in 1911 and was made assistant sales manager in 1927. He was elected a director of the company in 1935.

◆

▸▸▸ *T. M. Deal,* president of the Link-Belt Speeder Corporation, has announced the appointment of *Hayes Parsons* as sales manager for the corporation. Mr. Parsons has represented the Speeder Machinery Company, and (after the consolidation) Link-Belt Speeder Corporation in the Seattle district.

◆

NATIONAL STARCH PROMOTES FOUR

Four major executive promotions were announced by National Starch Products, Inc., at its national sales convention at the Hotel Delmonico, New York City, February 23-24.

Chester A. Gage, vice president and for the last fifteen years manager of the company's mid-western division, has been named vice president in charge of sales and has joined the New York executive staff; Milton J. Heim, manager of National's central division at Philadelphia, has succeeded Mr. Gage at Chicago; Donald D. Pascal, head of the service department at New York has succeeded Mr. Heim, and Philip M. Liner, who for many years covered the southern New England states, has been appointed manager of the New England division at Boston.

Mr. Gage is president of the National Paper Box Supplies Association and the Chicago Paper Box Supply Men's Association.

◆

▸▸▸ *D. S. Kerr,* a member of the Allis-Chalmers Manufacturing Company since 1922, has been appointed manager of the company's Atlanta (Georgia) branch where he will have both the Chattanooga and Knoxville offices under his jurisdiction.

◆

"UNCLE JAKE" HOME AFTER TRIP TO TEXAS

Jacob ("Uncle Jake") Kindleberger, chairman of the board of the Kalamazoo Vegetable Parchment Company, returned to Kalamazoo recently after a month's sojourn in Texas. Mr. Kindleberger stated that he found some brand-new impressions of Texas and commented on the cotton situation in that state. "Uncle Jake" indicated that he believed Texas could find a solution to the problem by developing new uses for cotton just as men in the paper industry have found new uses for paper.

◆

▸▸▸ *George H. Spencer,* formerly connected with the Bantam Roller Bearing Division of the Torrington Company, is now a member of the Pusey and Jones Corporation's sales department. Prior to his connection with the Wilmington (Delaware) concern, Mr. Spencer was associated with SKF Industries, Inc., Ogden Minton Vacuum Dryer Corporation, E. D. Jones and Sons Company, in addition to the Bantam Roller Bearing Division. Mr. Spencer has been connected with the paper industry for more than twenty years.

GEBHART DIRECTS N. A. M. RESEARCH

John C. Gebhart, executive director of the National Economy League, is now director of research for the National Association of Manufacturers.

Mr. Gebhart has been active in the research field since 1913. He received his B. A. degree from Western Reserve University in 1911 and took graduate work at Columbia University thereafter. He was associated with the Brooklyn Bureau of Charities from 1913 to 1917 and from 1917 to 1926 he was director of social welfare of the Association for Improving the Condition of the Poor.

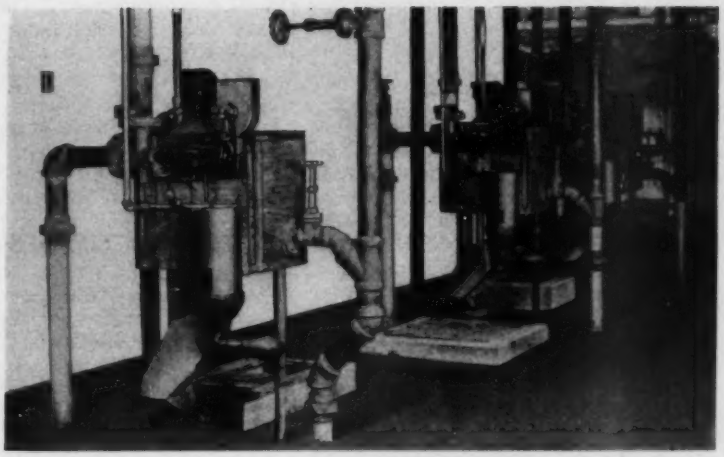
While director of research of the National Economy League and later as executive director, he made a continuous study of federal fiscal problems which received wide attention in the newspapers and periodical press.

◆

▸▸▸ Now associated with the Worthington Pump and Machinery Corporation, Harrison, New Jersey, is *John V. Jirasek,* who will be a special representative to the petroleum and chemical industries. Mr. Jirasek is a graduate in Chemical Engineering from the University of Prague and did post

John V. Jirasek

graduate work at the Sorbonne in Paris. A citizen of the United States, Mr. Jirasek has been engaged in research, experimental and development work with leading firms in the petroleum field, both in the United States and Europe, for the past twenty years.



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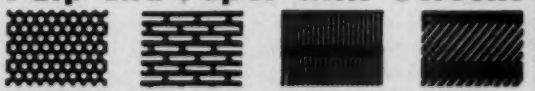

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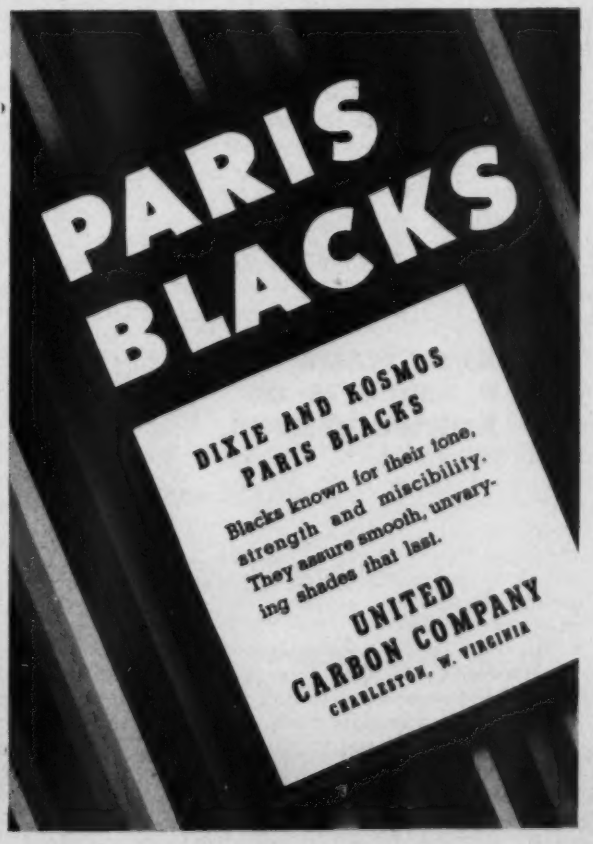
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MacMILLAN PRES. OF SPRINGFIELD PAPER COMPANY

A prominent figure in the paper industry since 1919, Earl B. MacMillan of South Hadley Falls, Massachusetts, has been elected president of the Springfield Coated Paper Company which was organized recently in New York City. The corporation has taken over a mill in Camden, New Jersey, and will produce fancy coated papers.

Mr. MacMillan was formerly sales manager of the Hampden Glazed Paper Company, Holyoke, Massachusetts, and of the Holyoke Card and Paper Company of the same town.

◆

▶▶▶ *Benjamin West,* associated with the Westfield (Massachusetts) plant of the Stevens Paper Mills, Inc., is now superintendent of the company's newly-acquired plant at South Hadley Falls, Massachusetts. The plant, formerly the old Hampshire Paper Mill, has been equipped with an 86-inch Harper machiner along with other machinery. Production is expected to begin late in April.

◆

▶▶▶ *Edward P. Connell,* treasurer of the Falk Corporation, Milwaukee, Wisconsin, has assumed the newly-created position of general manager, it was announced recently. In addition it is learned that *Walter L. Scheider* suceeds *Matthew A. Carpenter* as sales manager in charge of all active sales of all Falk products except those covered by the foundry division. Mr. Carpenter, who is secretary of the corporation, will continue in a supervisory capacity over the sales, sales promotion and advertising departments.

◆

GEO. RUDY MADE V. P. AND G. M. OF NORWOOD ENGR.

Suceeding Howard W. Hosford, who retired last year as vice president and general manager of the Norwood Engineering Company, Florence, Massachusetts, is George M. Rudy who was vice president of the company and general manager of the paper mill equipment division.

Mr. Rudy has been associated with the Norwood organization since 1904. In 1926 he became sales engineer and manager of the paper machinery division and in 1930 he was made superintendent and assistant general manager. Mr. Rudy became vice president and general manager of the paper mill equipment division in 1939. During the time he has been associated with Norwood, Mr. Rudy has won considerable recognition for inventions and developments in paper finishing machinery.

◆

C-Z EMPLOYEES HONOR DEXTER

More than 250 employees of the Crown Zellerbach Corporation, San Francisco, attended a surprise party on March 22 in honor of O. W. Dexter's twenty-fifth anniversary with the company. Mr. Dexter is head of the Crown Zellerbach Corporation's purchasing department.

Mr. Dexter joined the Crown Willamette Company in 1915 as office boy for President William Pierce Johnson and Vice President Louis Bloch. One

Louis Bloch (left) congratulates O. W. Dexter, purchasing head of C-Z Corp. on the anniversary of his 25 years with the company and predecessor companies.

of his principal duties was to drive executives about town with a white horse and surrey.

The first experience in his present line came at Floristan, California. From Floristan Mr. Dexter came to San Francisco to do accounting work for the Tulare Mining Company, then a C-W subsidiary. Later he entered the Crown Willamette purchasing department under D. J. Goldsmith, became San Francisco manager of the Pacific Coast Supply Company when only 21 years of age and subsequently, purchasing agent for the Crown Willamette Paper Company. He became head of the C-Z purchasing department in 1932.

◆

▶▶▶ *H. J. Farren,* who has held the position of manager and superintendent in several paper mills throughout the country, is now mill manager of the New England Pulp and Paper Company, Otter River, Massachusetts, which company is producing pulp by the Oxford and McGregor processes.

APPLEBAUM NOW A DIRECTOR OF PERMUTIT CO.

Well known throughout water works and power fields and industry in general, S. B. Applebaum, vice president and secretary of the Permutit Company, New York City, was elected a director at the company's annual meeting on March 20.

Mr. Applebaum is the author of many articles in the technical press and has addressed numerous scientific bodies. His work in the development of water conditioning processes is widely known. He has been associated with the Permutit Company for more than twenty-five years.

◆

▶▶▶ *M. E. Cody,* resident manager of the Union Bag and Paper Corporation's Savannah (Georgia) plant, was elected a director of the company at a recent meeting of the board of directors. Mr. Cody, who has been active in the kraft paper industry in the south for some years, took charge of the company's Savannah operations in July of last year.

◆

M. I. T. APPOINTS SAGE A DIRECTOR

Widely known in business and industry throughout the country by virtue of his duties as placement officer of the Massachusetts Institute of Technology, Nathaniel McL. Sage has been appointed director of the Institute's division of industrial co-operation. This division co-operates frequently with the various technical departments of the civic, state and federal governments in the solution of important scientific and engineering problems affecting the welfare of the public.

Mr. Sage graduated from the Institute in 1913 and has been associated with the Bethlehem Shipbuilding Corporation, Morton C. Tuttle Company, the Raytheon Manufacturing Company and the Atlas Truck Corporation. In his present position he will also continue as placement officer.

◆

NEW CHIEF ENGR. AT CAMERON MCH. CO.

William M. Stocker, associated with the Cameron Machine Company, Brooklyn, New York, since 1925, has been appointed chief engineer to succeed R. Mc C. Johnstone who resigned from the company some months ago.

As service manager of the Cameron Machine Company Mr. Stocker has

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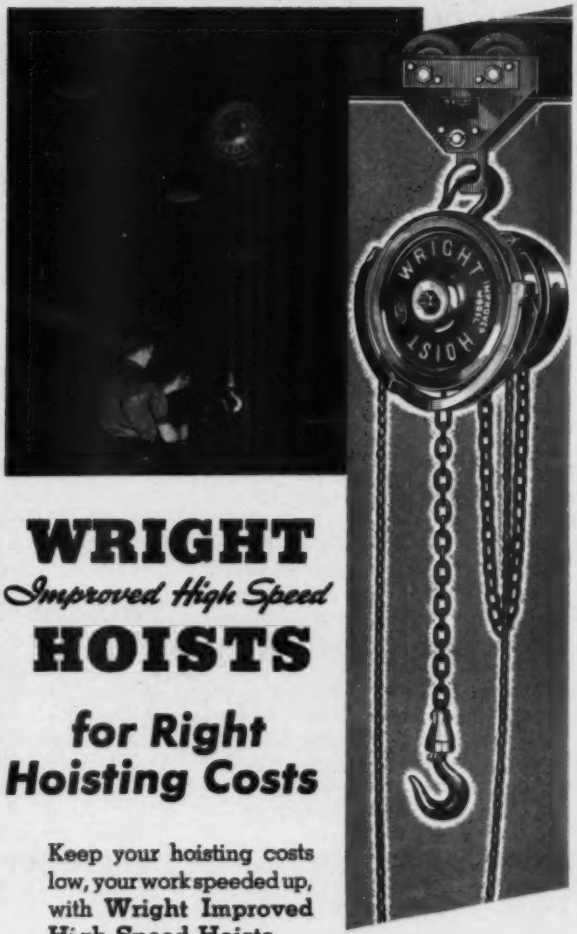

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CHARLES A. WHITE

Associated with Leeds and Northrup Company, Philadelphia, since 1920, Charles Arthur White, secretary-treasurer of the company, passed away March 2 after a short illness. He was fifty-eight years old.

Mr. White was born near Poughkeepsie, New York, and was associated with the Adriance Platt and Company from 1902 to 1914. From 1915 until 1920 he was cost accountant and later purchasing agent of the Hero Manufacturing Company. He joined the Leeds and Northrup Company as chief accountant and soon accepted the responsibilities of an expanding accounting department. He became secretary-treasurer in 1928. He is survived by his widow and one son.

◆

▸▸▸ For many years secretary of the Bathurst Company, Bathurst, N. B., *Sylvester Bond* passed away March 7 at the age of 62. Mr. Bond was born in Orangetown, Massachusetts, and went to Bathurst in 1915 where he was employed by the Cascapedia Manufacturing and Trading Company, a Bathurst Power and Paper Company subsidiary. He was appointed assistant manager of the Bathurst Company in 1937.

◆

EDWARD A. SHERMAN

Edward A. Sherman, assistant chief of the Forest Service, United States Department of Commerce, passed away March 28 after several years' illness. He was sixty-nine years of age and had been associated with forestry work for thirty-seven years.

Mr. Sherman was born in Iowa and was graduated from the Iowa State College of Agriculture and Mechanic Arts. He entered government work in 1903, serving as supervisor of the General Land Office and in 1905 became a member of the Forest Service when it was established in the Department of Agriculture. He was, at various times after that date, in charge of several National Forests, later becoming chief inspector of the Northern Rocky Mountain region and regional forester of the Intermountain Region. He was made associate forester in 1920 and assistant chief and adviser in 1935.

Mr. Sherman was the author of a number of articles and publications on forestry and was a Fellow of the Society of American Foresters.

◆

▸▸▸ *D. C. Jones,* vice president and general manager of the Lunkenheimer Company, Cincinnati, Ohio, passed away on March 11 after a brief illness. Mr. Jones was born in Cincinnati in 1876 and entered the employ of the Lunkenheimer organization in 1894. He was prominently identified with industrial and banking activities in Cincinnati and also had served as president of the American Supply and Machinery Manufacturers' Association.

◆

THOMAS F. SULLIVAN

Thomas F. Sullivan, first vice president and general manager of the Monroe Paper Products Company, Monroe, Michigan, passed away March 8, at the age of 45.

Mr. Sullivan came to Monroe in 1929 as production engineer for the River Raisin Paper Company. He accepted the general managership of the Monroe Paper Products Company in 1931.

Mr. Sullivan was born in Chicago in 1895. He was a graduate of the Armour Institute of Technology and was associated with the Eddy Paper Corporation of Three Rivers, Michigan, and the Container Corporation, Chicago, prior to his becoming connected with the Monroe Paper Products Company. Mr. Sullivan was appointed first vice president and general manager of the Michigan paper company in 1934.

Surviving Mr. Sullivan are a daughter, four brothers, and two sisters.

Thomas F. Sullivan

◆

FRED W. MOTSCHMAN

Fred W. Motschman, mill manager of the Southern Kraft Corporation, Marinette, Wisconsin, passed away March 4 in St. Petersburg, Florida, where he had resided for two weeks because of ill health. Mr. Motschman was 39 years of age.

Mr. Motschman was a graduate of Tufts College and was first employed by the Brown Company, Berlin, New Hampshire. He was subsequently associated with the Pejepscot Paper Company, Brunswick, Maine and the Champion Paper and Fibre Company, Canton, North Carolina. After leaving the Champion company, Mr. Motschman became connected with the Continental Paper and Bag Company at Rumford, Maine, later joining the International Paper Company at Glens Falls, New York. Still later he became mill superintendent for the Continental company and technical director of the Hudson River mill of the International Paper Company.

In 1937 Mr. Motschman became manager of the Southern Kraft mill at Marinette. He is survived by his widow and a son.

◆

▸▸▸ *Gerald H. Davidson,* director and secretary of McFarlane Son and Hodgson, Ltd., Montreal wholesale stationers and paper merchants, lost his life in the wilds of Labrador during the winter. Mr. Davidson, together with two companions, apparently lost his direction while flying to North West River, Labrador, and the plane was forced down some 150 miles north of their objective. Numerous searching parties failed to locate the men until March 1.

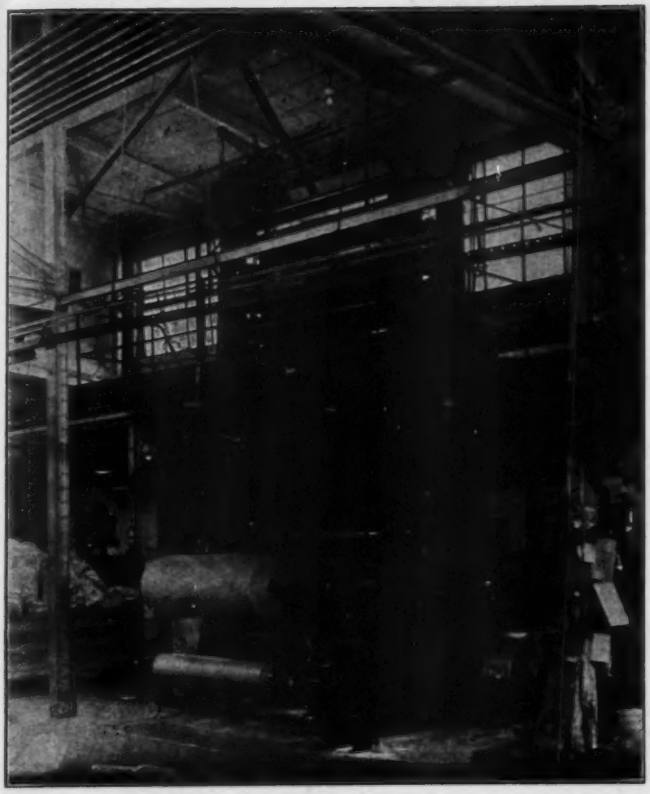
◆

S. B. BOND

Secretary-treasurer of the Bathurst Power and Paper Company, Bathurst, New Brunswick, since its inception in 1915, S. B. Bond passed away March 7 after a year's illness.

Mr. Bond was born in Orangetown, Massachusetts, and became associated with the late Angus McLean, founder of the Bathurst company, in a lumbering project, following which they became partners in the building and operation of the Bathurst pulp and paper plant.

Surviving Mr. Bond are his widow, three sons, and three daughters.



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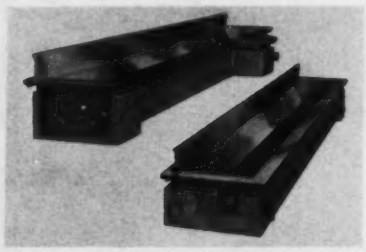
NEW EQUIPMENT AND SUPPLIES

Wax Melter

A wax melter, built by L. O. Koven & Bro., Inc., Jersey City, New Jersey, for a paper converter, indicates a design which, with variations in dimensions, should be adaptable to certain paper mill operations.



The inner melter tank of the unit is made of stainless steel. It is 10 ft. long, 18 in. wide, and 12 in. deep. A bronze steam jacket encases the melter tank; and this jacket in turn is covered with a layer of cork insulation that is retained by an outside housing.

Photoelectric Relay

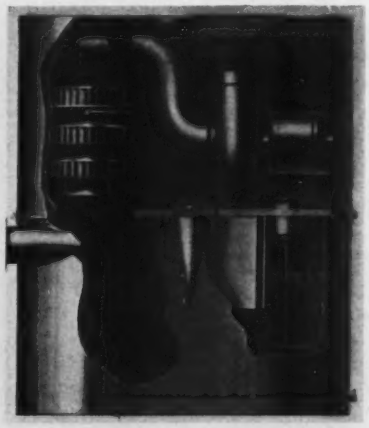
A compact photoelectric relay which can be used for counting, sorting, weighing, measuring, signalling, and similar functions, has been announced by the Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa.

Designated as the type *RQ Photo-Troller*, this device has two normally open and two normally closed contacts, each rated at 10 amperes on 115-volt a-c circuits. It operates on a change of 40 foot-candles, if not more than 15 foot-candles of extraneous light is present.

Increased sensitivity is obtainable by means of a condensing lens. The unit may be wall or bench mounted with open wiring, or with concealed or exposed conduit. It has a gray die-cast chassis with a block molded cover which is removable without tools.

Entrainment Separator

The Claude B. Schneible Company, 3951 West Lawrence Avenue, Chicago, Ill., has announced an entrainment separator for the removal of atomized or entrained liquids arising from various processes or operations and drawn into a ventilating system. Connected into the air intake duct, air with its burden of liquid is passed through an impingement unit, consisting of



a multiplicity of curved vanes vertically imposed upon a shelf with a central opening and with a conical section on top of the vanes with the point upward.

Air or gas entering the unit is rotated, separating larger liquid particles, and then passes through the turbine-like vanes to increase the centrifugal action and impingement growth of minute liquid particles, the clean air passing on and out into the duct, the separated liquid dripping down into a hopper at the bottom of the unit from where it is drawn off for re-use, salvage or disposal. The impingement unit can be flushed, when desired, with water or other liquid introduced just above the conical impingement plate section.

Novel Truck Feature For Bulky Loads

Towmotor Company, 1222 East 152d Street, Cleveland, Ohio, has announced the development of a lift truck which has an upper jaw extending from the top of the mast for preventing bouncing and spillage of lightweight goods that are being transported by the truck. When the forks of the truck, designated as the Lift-Grip Truck,

have entered the pallet, supporting the load, the hydraulic lifting mast is set in motion, with a lever at the driver's right. The load then moves up until the upper jaw, with spring-tension grip, contacts the top of the pile. According to the manufacturer, this lift-grip feature permits taking larger loads per trip, allows faster travel, and permits neater, more accurate stacking because pallets can be loaded to the full height of the stack. When the truck is needed for handling other than lightweight goods, the upper jaw can be removed.

Controllers for Temperature, Pressure, Flow and Liquid Level

Taylor Instrument Companies, Rochester, New York, have introduced a redesigned line of *Fulscope* air-operated recording and indicating controllers for temperature, pressure, rate of flow and liquid level. The new line, in addition to the convenience of combining in one instrument the conventional proportional response and automatic reset forms of control introduces a control feature, designated as Pre-Act. This feature, which makes control-valve corrections according to the rate of control-point deviation, reduces over-peaking or oscillating in response to sudden disturbances in the process or variations in the controlling medium. It also stabilizes operation after a change in set point and when equipment is started up.

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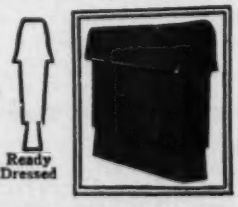

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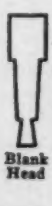

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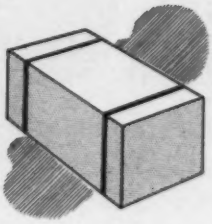

Stanley Strapping tensions container with strong steel bands, permits lightening your container with safety. Stanley Colorgraph Strapping dresses up your cartons . . . carries your name, trade mark or sales message in brilliant colors. Identifies your product instantly.

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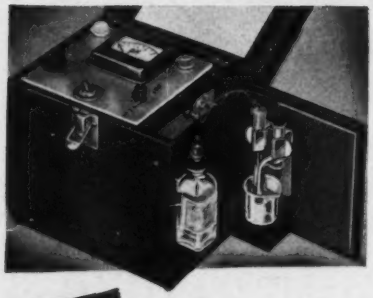

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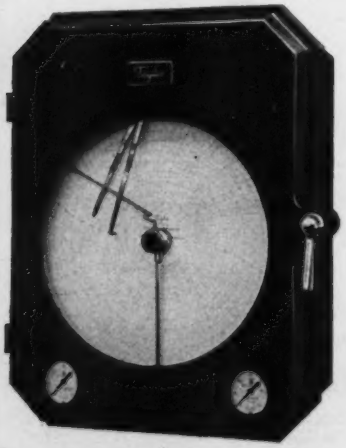
The automatic reset feature, which compensates for changes in load, is located in the instrument case and is adjustable over a wider range than previously. The case is of die-cast aluminum; is adaptable to face mounting or flush mounting; and is drilled and tapped to accommodate the most complete forms of controller mech-



anisms. Recording instruments are available with two complete control mechanisms with any combination of actuating systems except two manometers. Interchangeable unit construction permits conversion from one form to another in the field.

Simplified air system includes improved relay air valve with precisely drilled sapphire orifice; removable 18-8 stainless steel nozzle; inbuilt metal-disc auxiliary air filters supplement large external filter; air gauges inside case; and operated on an air supply of 20 lb. per sq. in.

Other improvements include more durable electric chart clock (also available in explosion-proof housing); spring driven clock optional; improved rapid chart changing mechanism; and Neoprene gaskets throughout.

Centrifugal Pump

A centrifugal pump, with motor and pump engineered as an integral unit, has been announced by the Worthington Pump and Machinery Corporation, Harrison, New Jersey. Known as the *Monobloc,* this pump

is offered in sizes of 1 in. to 4 in. with capacities to 1000 g.p.m. against heads up to 280 ft. It is available in bronze fitted, all-iron and all bronze construction, horizontal or vertical mountings with motor of any electrical characteristic.

Vernier-Control Variable Speed Transmission

Link-Belt Company, 2045 West Hunting Park Avenue, Philadelphia, Pa., has announced that it is now in position to equip all sizes of the Link-Belt P. I. V. Gear variable speed transmission with vernier control. The transmission is equipped with two hand-wheels, one for direct control, the other for vernier control,

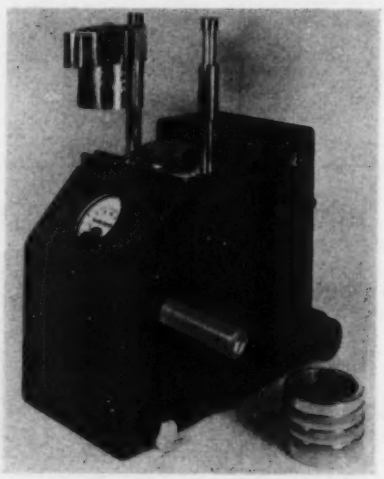
the latter providing either 30 turns or 7½ turns to one of the former. The unit is being recommended by the manufacturer for synchronizing the speeds of integrated machine operations, controlling feeders, weighing operations, and for other operations wherever uniformity of product can be assured by such close speed regulation.

New Finish for Stainless Steel Castings

The Cooper Alloy Foundry Company, Elizabeth, New Jersey, has announced a patented electrolytic process, known as *Lustracast,* for finishing stainless steel castings. The advantages claimed for the process are: It gives a high, lustrous sheen comparable to the finest mechanical polishes, but at lower cost; it cleans and brightens odd-size, odd-shaped castings formerly impractical or impossible to polish; and it assures longer life by greater resistance to corroding liquids.

Instrument for Moisture Determinations

The Moisture Register Company, 1029 North Sycamore Street, Los Angeles, has announced a self-contained, portable unit for the moisture testing of granular, powdered, pelleted and loose pulp materials. The machine, designated as the *Granular Moisture Register,* weighs 40 lb., is 11 in. high by 11 in. deep by 7 in. wide; and is finished in crackled lacquer and chrome. It is powered by low-cost batteries, and is supplied with meter dial reading in direct moisture



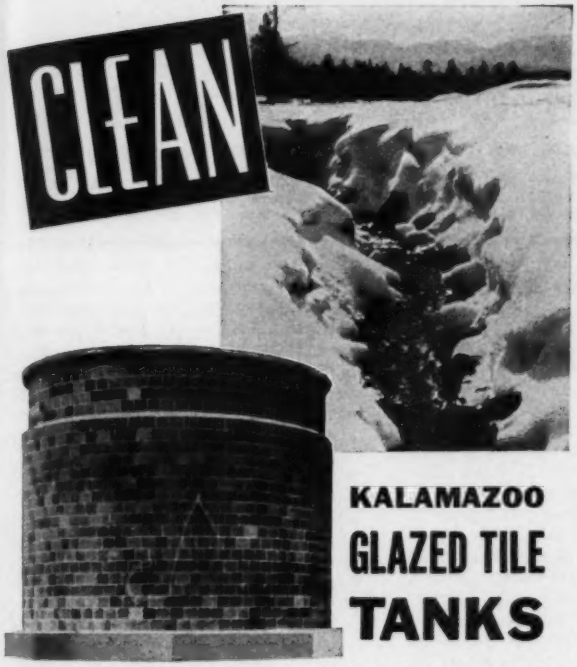
percentages or with arbitrary numerical scale from which user determines calibrations.

Material to be tested is placed in cup at top of machine and operation of crank lever produces hydraulic pressure to squeeze air from sample, after which, measurement is made by operating small switch lever. The same lever, thrown to upward position, releases hydraulic pressure and returns plunger to open.

Complete test is made in less than one minute. Readings are independent of room temperature, humidity, or temperature of sample in normal ranges.

Electrician's Test Kit

A test kit for electricians, containing ammeter, voltmeter, and transformer, has been announced by Herman H. Sticht & Company, 27 Park Place, New York, New York. The complete kit weighs about 10 lb. Component parts may be used individually. Various combinations in the kit are available.



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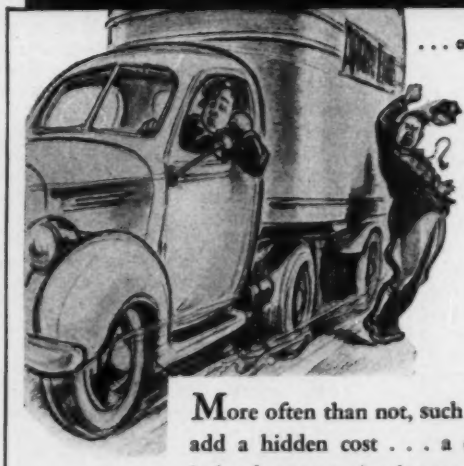

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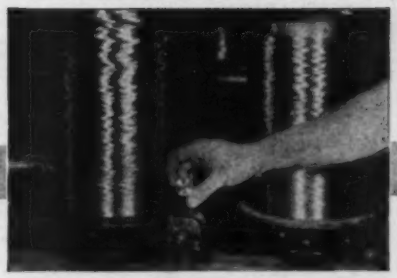

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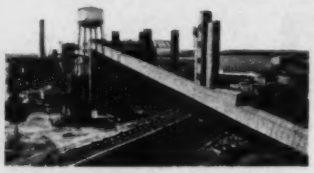

All Rayonier Incorporated West Coast Sulphite mills are equipped with Stebbins lined digesters and other tanks and vessels, and so—the digesters, acid towers, combustion chambers, sulphur melting tanks and settling tank of its new sulphite mill at Fernandina, Fla., are all equipped with Stebbins corrosion resistant linings.

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TECHNICAL DEVELOPMENTS

The following abstracts are of the latest developments found in the foreign press.

Effect of Sulphur Dioxide on Vegetation

This is the resumé of a detailed report which was published by the National Research Council of Canada. The investigation covered the period 1929-1937. The genesis of the study resulted from the injurious effects of smelter fumes, in a British Columbia plant, located in a valley about 7 miles from the U. S. A. border. Since the prevailing winds were from North to South, there was a tendency to carry fumes across the border, and damage was claimed by farmers in the United States. In 1932, an efficient recovery system was installed, and this reduced the SO_2 content to a point which never exceeded 0.033% during the growing season. This figure is below that found in industrial areas. In the winter the gas usually occurs for longer periods in a much higher concentration. In areas of pollution, it was shown that the sulphur content of plants was much greater than normal. The factors were: time of exposure and concentration. In general, plants can take up small doses of sulphur dioxide without damage, but heavy doses over a relatively brief period may prove deleterious. Near the smelter the soil had suffered, but eight miles away it was substantially normal. In those areas in which pollution had occurred, the growth curves of trees were followed by increment borings (back to the annular rings of 1916), and retardation of growth was shown prior to 1932. In years when precititaion should have been favorable, the growth rate was impeded. Conifers were much more sensitive to SO_2 during the growing than during the dormant season, and transplanted trees were more susceptible than those in their natural habitats. Of all the species studied, larch suffered the most. Any factors which favored photosynthesis (humidity, light intensity, etc.) also favored absorption of SO_2 and plant injury. The soil moisture and the age of the plant are factors. A sensitive measure of the effect of sulphur dioxide on the leaves is photosynthetical activity. This is better than appearance of the markings. Short exposure to fumes causes a type of shock, with slight falling off of carbon dioxide assimilation. Recovery occurs unless the exposure has been too severe. G. Stafford Whitby. Chemistry and Industry, 58, 991-9 (1939) through Bull. Inst. Paper Chem. 10, 175-6 (1940).

Oxycellulose

A study of the action of alkali on oxidized cellulose was made. The oxycellulose resulted from the oxidation of cellulose by means of $KMnO_4$, had a copper number of 14, and was shown to contain uronic acid groups. 0.25 Normal NaOH dissolved 50% of the product and the soluble part had evidently undergone decomposition of the type suffered by complex sugars when treated with alkali. The portion insoluble in NaOH had a low copper number and contained no acid groups. It was readily methylated and acetylated and it was evidently made up of about 90 glucose units (when analyzed by the end group method). When this insoluble portion was treated with 2.5 Normal NaOH, about 50% of it dissolved. The insoluble part had a chain length of about 60 units and the soluble part of about 35 glucose residues. The former molecular size was determined by viscosity measurements of the acetate. Acid hydrolysis of the oxycellulose in the cold gave rise to an unidentified albionic acid. G. L. Godman, W. N. Haworth, and S. Peat. J. Chem. Soc. (London) December 1939, 1908-14, through Bull. Inst. Paper Chem. 10, 187 (1940).

Straw Pulp by the Nitric Acid Process

The experiments were carried out with the view of producing pulp for rayon. While the ash content never dropped below 0.6%, which is relatively unsatisfactory and above that of commercial sulphite pulps, certain properties were actually better than those of sulphite, notably the alpha cellulose content, which reached over 95% when 9% HNO_3 was used, and the low pentosan content, which at its minimum was 1.85%. Complete digestion was obtained when the straw was heated for 2 hours with 5% nitric acid, followed by after treatment with 2% NaOH (both at 100 deg. C.). Under these conditions, the yield was 31%, and the alpha cellulose content was 93.6%. When sulphuric acid was substituted for a part of the nitric acid the pulp yield dropped somewhat. I Simoda N. Ebara, and T. Murakoski. Cellulose Ind (Tokyo) 15, 7-9 (1939), through C. A. 34, 1846 (1940).

Black Liquor Studies

After standing for several days, black liquor no longer gave hydrogen sulphide when treated with acid. The sulphide content decreased rapidly when the liquor was kept in sealed containers. The present work gives methods for following changes taking place in the liquor on storage. An apparatus for sampling vapors and gases from digesters and evaporators in sulphate mills has been described. Procedures are given for the determination of H_2S, mercaptans, and sulphides in the waste gases, and for the determination of the sulphide content of black liquors. The gases from the black liquor after cooling were passed successively through 10% cadmium chloride containing 1% HCl to absorb the H_2S; through a

5% mercuric cyanide solution to absorb the mercaptans, and finally through a 5% mercuric chloride solution to absorb the organic sulphides. The precipitates give the amounts of these impurities. The sulphide content of black liquor is determined by treating with 10% ammonium chloride solution, boiling in an oxygen-free atmosphere of nitrogen, and determining the gases as above. The absorption of oxygen by the black liquor and, and its rate of increase with the time has been determined. The oxidation is very rapid and the sulphide sulphur is the first to be oxidized. H. Bergström and K. G. Trobeck. Svensk Papperstidn. 42, 554-7 (1939) through Bull. Inst. Paper Chem. 10, 185 (1940). Cf also C. A. 34, 1171 (1940).

Waste Paper and Its Utilization

The Rassow-Herfurth method gives a new process for regenerating newsprint. The waste paper is defibered in a Wurster machine, thence to a breaker beater with tetra-sodium pyrophosphate (one per cent on the basis of the weight of dry waste). Kaolin adsorbs the loosened printers ink. The pulp is not washed to avoid losses, and about 20 per cent of the waste product is added to 18 per cent chemical and 62 per cent mechanical pulp in a fresh furnish. There are no white water losses. Kotte. Papier-Ztg. 64, 1235-6; 1253-6; 1273-6 (1939) through Bull. Inst. of Paper Chemistry 10, 37 (1939).

Further Pulping of Manchurian Woods

In 1938 (Cf C. A. 32, 8134) the author delignified a number of woods the pulps of which have now been submitted to a 2-stage bleaching process. Of the woods studied, *Picea obovata* Ledeb., and *Abies nepherolepsis* Max. appeared to furnish the pulps most suitable to rayon and paper manufacture. They gave respectively 41.4% and 37.5% bleached pulp and alpha cellulose contents of 89.5% and 91.8%. *Pinus koraiensis* and certain of the hardwoods gave bleached pulps in higher yield than the above, but these products proved inferior. Manchurian aspens were readily cooked by the sulphite process, giving readily bleachable pulps. Manchurian birch, while giving the highest volume weight yield, gave rise to a pulp having only 79% alpha cellulose. I. Miura. Cellulose Ind. (Tokyo) 15, 4-6 (1939), through C. A. 34, 1845 (1940).

Hydrocellulose

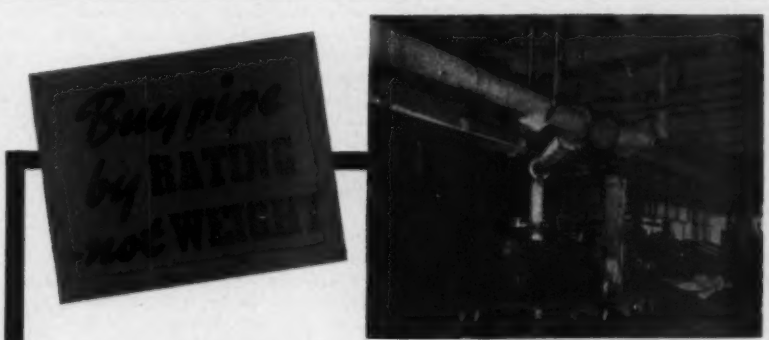
Using the "end-group" method of assaying methylated products, the authors studied both powdered and fibrous "hydrocelluloses", the constitution of which was similar to that of the original cellulose, except that the number of glucose units in the chain molecule was lower. Methylated powdered hydrocellulose showed an average molecular size corresponding to a chain of 70 glucose units. In fibrous hydrocellulose, the material was separated into fiber and powder. On hydrolysis each fraction gave over 90% crystalline glucose. Acidic groups and especially uronic acid groups were absent. End group assay showed that the mixed fibrous material contained an average of 120 units, the mechanically separated fibrous part contained about 200 units, and the iodine number of the powder corresponded to 70 glucose units. The authors have also compared the alkali solubility of fibrous and powdered hydrocellulose with that of linters and cello-dextrins. H. C. Carrington, W. N. Haworth, E. L. Hirst and M. Stacey, S. Peat and W. J. Wilson. J. Chem. Soc. (London) Dec. 1939, 1901-8, through Bull. Inst. Paper Chem. 10, 187 (1940).

Preservatives Used in Paper and Board Industries

A general survey is given of industrial preservatives, their advantages and disadvantages. For example while mercuric salts and fluorides are good preservatives, their toxic properties have to be reckoned with when edibles are to be stored in paper or carton containers. Formaldehyde (as preservative) may later cause the discoloration of rayon materials. Boric and salicylic acid require fairly large amounts for effective preservation. Attention is drawn to the following: chlorothymol which has a surprisingly high phenolic coefficient; chloroisothymol; various salts of chloro-phenol and cresols (e.g. the sodium derivative of 6-chloro-3-hydroxytoluene), toluenesulfonchloramide salts, chloroxylenols, hexylresorcinol (which is non-toxic and non-odorous); sodium salt of 2-hydroxydiphenyl (which is relatively harmless to man, but which is 20 times more effective than phenol). A little as one-sixteenth of one per cent appears to inhibit microorganisms. Furthermore in somewhat higher amounts this reagent actually improves sizing. The properties of the disinfectant which must be considered are toxicity, stability of solution, the greatest dilution at which it is still effective, and the effect of temperature (volatility, etc.). The author points out that frequently combinations of preservatives must be used under certain conditions. Often the pH of the solution to which preservatives are added is of importance. Frequently, too, excellent preservatives are not suitable. Fritz Ohl. Wochenblatt Papierfabr. 70, 839-41 (1939).

Separation of Artificial From Natural Cellulose Fibers

This is a simple and rapid method for the separation quantitatively of artificial fibers prepared from hydrated cellulose from fibers obtained from natural cellulose. The fiber mixture is treated with cold 10% NaOH containing a wetting agent. The soaked fibers are pressed by means of rollers on a fine screen where the artificial fibers disintegrate and pass through the meshes due to their lower mechanical strength, while the natural fibers are retained on the screen since even in the swollen condition their mechanical strength is sufficiently high. Prior to the test, cellulose acetates must be removed by treatment with acetone. The method is not applicable to wool. Karl Schwertassek. Angew. Chem. 52, 700-1 (1939); C. A., 34, 1171 (1940).



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PAPERMAKING PATENTS

IN THE UNITED STATES—Compiled by James Atkins, Registered Patent Attorney

Inquiries should be addressed to James Atkins, Munsey Building, Washington, D. C.

Cylinder Paper Machine

Patent No. 2,162,097. Walter W. Metcalf, Hoosick Falls, N. Y. Application March 17, 1936, Serial No. 69,281. 6 Claims. (Cl. 92—43). In a paper making machine, the combination with a vat, of a cylinder mold rotatbly mounted therein on a horizontal axis, means cooperating with said mold for removing the paper web therefrom, means comprising an inner wall adjacent said mold and an outer wall spaced from said inner wall to form an upwardly extending duct for delivering stock to said mold, said inner wall terminating in close proximity to the surface of said mold on the ascending side in a zone substantially above the bottom thereof in which said zone stock is initially delivered to said mold, said outer wall extending upwardly beyond said inner wall around a substantial portion of the upper ascending quadrant of said mold and comprising a first rigid wall section pivotally mounted at its lower end to swing toward and away from said mold and a second wall section having its side facing said mold preformed to a definite, fixed contour merging smoothly with the mold-facing surface of said first section and pivotally connected to the upper end of said first section whereby it may swing with said first section whereby it pendently thereof means cooperating with said wall sections for swinging them towards or away from said mold, and means for maintaining the white water level in said mold entirely below the level of the zone within which stock is delivered to said mold from said duct; the topmost and terminating edge of said second section being spaced from the zone of web removal from said mold and the path of the moving stock and partially formed web being free and unobstructed between said edge and said removal zone. In a paper making machine of the character described, the combination with a vat, of a cylinder mold rotatably mounted therein on a horizontal axis, means forming a duct for delivering stock to said mold, means for indicating the flow velocity of the stock in said duct in a zone near the zone of initial delivery of said stock to said mold, and means for varying said velocity.

Forming Wire Support for Paper Machines

Patent No. 2,170,109. Earl E. Berry, Beloit, Wis., assignor to Beloit Iron Works, Beloit, Wis., a corporation of Wisconsin. Application December 15, 1937, Serial No. 179,863. 3 Claims. (Cl. 92—44). In a paper making machine having a forming wire trained around a breast roll and a couch roll, a plurality of closely spaced parallel small diameter table rolls mounted under the upper run of the forming wire between the breast roll and couch roll for supporting the wire and elongated journals rotatably supporting the rolls throughout substantially their entire length and extending for more than 180° around the rolls, the improvement which comprises an extension on each journal on the breast roll side of the table roll, said extension curved around the roll almost to the top thereof and extending laterally outward from the top of the roll toward the breast roll to a point spaced from the table roll but terminating short of the adjacent table roll journal, said extension defining a flat surface ahead of the table roll immediately under the wire that operates to stop drainage through the wire and to wipe off films of liquid carried by the under side of the wire and said curved portion of the extension operating to prevent water on the roll from being thrown up against the wire.

Separator of Special Material for Paper Stock Treating Engines

Patent No. 2,161,848. Archer Le Roy Bolton, North Andover, Mass., assignor to John W. Bolton & Sons, Inc., Lawrence, Mass., a corporation of Massachusetts. Application August 6, 1935, Serial No. 34,922. 8 Claims. (Cl. 92—27). As an article of manufacture, a bodily transportable separator for paper stock treating engines of the beater and Jordan type, which is made of an artificial material which has no natural grain, but which has some elasticity and which will swell when in contact with water without becoming soft.

Paper Machine Suction Slice

Patent No. 2,165,549. Lloyd Hornbostel, Beloit, Wis., assignor to Beloit Iron Works, Beloit, Wis., a corporation of Wisconsin. Application November 29, 1935, Serial No. 52,132. 9 Claims. (Cl. 92—49). A suction slice lip comprising a sheet of resilient material having a plurality of parallelly disposed channels extending from edge to edge thereof, and means on opposite sides of the sheet adjacent one edge providing gripping surfaces for holding the lip.

Drier Felt for Paper Machines

Patent No. 2,167,542. William A. Barrell, North Andover, Mass., assignor to Lawrence Duck Company, Lawrence, Mass., a corporation of Massachusetts. Application September 3, 1937, Serial No. 162,271. 2 Claims. (Cl. 139—410). A drier felt of the type having a face ply and a back ply each constructed of plain-woven warp and filling strands, and the plies being connected together by interwoven binder strands; in which the warp strands of the face ply are more numerous than the warp strands of the back ply, in the order of from nearly twice to more than four times as many, while being of substantially like diameter and weight, and are so closely crowded together laterally as substantially to prevent contraction in width, and elongation, of the felt in use, the binder strands being relatively small in proportion to the body warp strands, and the warp strands of the back ply are spaced apart from one another throughout the width of the felt.

Felt Conditioner for Paper-Making Machines

Patent No. 2,173,317. Frederick William Vickery, Westminster Bridge, London, England. Application February 27, 1937, Serial No. 128,283. In Great Britain February 1, 1937. 2 Claims. (Cl. 92—50). A felt conditioner comprising a support extending across the whole width of the felt parallel to the felt, a carriage thereon, means for traversing said carriage along the support, a narrow suction box upon said carriage operating on a fraction of the working width of the felt, a perforated endless band passing between said suction box and the felt contacting with the perimeter of the suction box and surrounding it and the carriage, a nozzle upon said carriage directed into the angle between said endless band and the felt in advance of the suction box, an auxiliary suction box acting on the felt on each side of said nozzle from a point in advance of said nozzle to the area acted on by the principal suction box, and means for maintaining said auxiliary suction box under a reduced vacuum as compared with the principal suction box.

Paper-Slitting Device

Patent No. 2,173,931. Arthur E. Broughton, Glens Falls, N. Y. Application August 25, 1938, Serial No. 226,721. 6 Claims. (Cl. 164—47). A paper slitting device comprising a carriage, a supporting structure for said carriage permitting rectilinear reciprocating movement of said carriage therein, means mounting said supporting structure permitting turning of said supporting structure to vary the angle of possible reciprocating movement that may be imparted to said carriage, means for reciprocating said carriage, a knife blade carried by said carriage, and means for adjusting the position of said knife blade longitudinally of said carriage.

Process and Apparatus for the Manufacture of Paper

Patent No. 2,168,560. Edgar Alexander Charlton, New York, N. Y., assignor to International Paper Company, New York, N. Y., a corporation of New York. Application December 17, 1934, Serial No. 757,763. Renewed March 27, 1937. 5 Claims. (Cl. 92—40). In a method for the manufacture of paper, the steps of depositing on a paper making wire a layer of fibrous stock including a filler, subjecting said layer to drainage to form a web, depositing on said web a layer of fibrous stock containing no filler, subjecting said web and layer to drainage to form a composite web, thereafter depositing on said composite web a layer of fibrous stock including a filler, and subjecting said composite web and deposited layer to drainage to form a web of material the opposite faces of which contain a filler.

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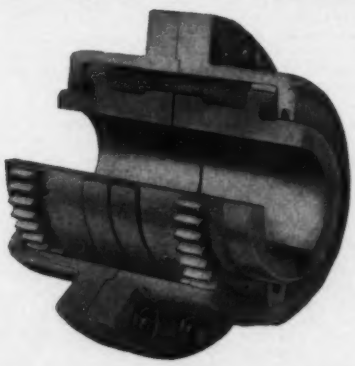

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Write for descriptive literature

New Catalogues and Publications

Allis-Chalmers Mfg. Co., Milwaukee, Wis.—A revised catalogue section (No. 151) which introduces new horsepower ratings for multiple V-belt drives based on the new formula developed by Robert F. Vogt and recently adopted by the industry, has been prepared by this company. The new section, 34 pages in length and punched for loose-leaf filing, contains complete information on the new horsepower ratings for Texrope drives. Considerable informative data, including a belt selection table, a chart to determine length of Texrope belts, horsepower ratings of Texrope belts, rim weight chart and various other data, are to be found in this catalogue section.

Babcock and Wilcox Co., New York, N. Y.—A new 16-page bulletin which describes and illustrates this company's design 32 cross-drum boiler (a straight-tube, sectional-header unit for pressures of 250 pounds or less) has been issued lately. The text of the bulletin deals with the effect of straight-tube cross-drum design on the cost of the unit, cleaning and inspection. Photographs and drawings are included.

Bausch and Lomb Optical Co., Rochester, N. Y.—A very interesting publication (Catalog E-21) on photomicrography has been released lately by this company. The well-illustrated and well-written publication deals with factors in photomicrography as well as the various equipment produced by this company.

Brad Foote Gear Works, Cicero, Ill.—A handy and extremely informative catalogue (No. 110) on this company's gears, reducers, cog belts, sprockets, bearings, pulleys and chains, has been released lately. The spiral-bound publication, containing 246 pages, gives complete data on all the company's products in addition to other useful general engineering information. This book should be in every industrial library as a ready reference. It is a compact edition (5¼ by 7½) and should prove valuable as a guide in every plant.

Chicago Belting Co., Chicago, Ill.—An interesting catalogue describing and illustrating, in a colorful manner, the types and uses of leather belting produced by this company, has been issued recently. The spiral-bound book, 24 pages in length, deals with various features of the belting, shows how the company makes tests on the product, and contains numerous installation photographs. Accessories are also listed and illustrated.

Chicago Electric Co., Chicago, Ill.—A new folder on the motor generator sets designed and rebuilt by this company has been issued recently. Several photographs illustrate the various motors and written material explains the company's service.

Cochrane Corp., Philadelphia, Pa.—A new 8-page bulletin (2950) has been released by this company. The bulletin deals with the company's baffle-type moisture and oil separators for use in vertical or horizontal steam, gas and air lines. Dimensional data and list prices are included in addition to photographs and drawings.

Crane Co., Chicago, Ill.—*Valve Selection Guide for Pulp and Paper Mills* is the title of a new volume (7¾ by 10¾) recently published by this company. The book, bound attractively in a stiff cover, consists of more than sixty pages of pertinent information covering the selection of valves for pulp and paper mills. The book is divided into three convenient sections, namely: pulp processing, paper mill and power plant. The presentation, for the most part, is in the form of a tabulation arranged to show the type of valve, size of valve and the kind of end outlets for the valve that is being used for a specific service application. There are also several pages devoted to some typical valve installations.

De Laval Steam Turbine Co., Trenton, N. J.—A splendidly-illustrated, well-written publication is the new catalogue (F) recently issued by this company. Its 51 pages are full of valuable information and interesting photographs pertaining to the company's centrifugal blowers and compressors. The subject matter covers applications of the blowers and compressors, their design and construction, manufacturing methods and testing, compression of gases, in addition to some very interesting data regarding formulas and constants and pipe friction.

Dodge Mfg. Corp., Mishawaka, Ind.—This company's new bulletin (A-325) gives complete information about the new Dodge-Timken double interlock pillow block. The bulletin portrays clearly, by extensive use of photographs and drawings, all the features of the unit. Specification tables are included. In addition to complete information about this new bearing, the bulletin contains selection tables which aid the reader in selecting bearings from the complete line made by this company.

A. P. Green Fire Brick Co., Mexico, Mo.—A new folder which describes and illustrates various features of this company's "Empire" fire brick has been released lately. The folder uses photographs and brief written material to explain the manufacture and uses of the product for general boiler and furnace work.

Leeds and Northrup Co., Philadelphia, Pa.—This company has just put out a new bulletin [E-50B (3)] which replaces bulletin 755. The 24-page bulletin describes the uses and various features of the company's Type K-2 potentiometers and accessories. Using photographs to good advantage, this bulletin contains much detailed information regarding the various equipment and includes specification tables and price lists.

Logan Engineering Co., Chicago, Ill.—This company's new bulletin (340) explains in detail the operation of the Aridifier, which removes moisture, oil and dirt from compressed air and gas by centrifugal force. Installation photographs combine with clearly-written material to make this an interesting release.

Metallizing Engineering Co., Inc., Long Island City, N. Y.—A new process (Metcolizing), designed to resist heat corrosion, is fully described in a new bulletin put out by this company. The bulletin explains what the term means, shows several photomicrographs of Metcolized mild steel, in addition to illustrating typical jobs done with the process. Maintenance men will be particularly interested in this bulletin.

Mixing Equipment Co., Inc., Rochester, N. Y.—A new catalogue (B-68-24M) issued by this company contains interesting information on the company's mixers, in addition to well-written material on principles of mixing, methods of mounting applications, etc. The catalogue is replete with cross-sectional drawings and specifications.

Yale and Towne Mfg. Co., Philadelphia, Pa.—A new hoisting equipment catalogue (PD-25) which contains complete information pertaining to the company's various models of chain hoists including the spur-geared, screw-geared and differential types has been published lately. The catalogue also covers information regarding to Pul-Lifts, as well as trolleys, and a brief description of the company's Cable King wire rope electric hoists. This catalogue, in addition to containing extensive data and information, is extremely well laid out which makes for clear and easy readability. Sketches and photographs are plentiful throughout this publication.

BOOKS

The Background and Economics of American Papermaking—The objective of Dr. Louis T. Stevenson in writing this volume was to portray the whole economic structure of papermaking as developed in the United States. The work is divided into thirteen chapters. It first discusses the history and development of paper. Then it analyzes such factors of production as natural resources, labor, capital and organization. Then it treats, in the order given, of cost behavior, characteristics of the demand for paper, price behavior, relation of paper industry to the business cycle, combination movement, and social control of the paper industry. In concluding his book, Dr. Stevenson ventures to take a look into the future. The book, published by Harper & Brothers, 49 East 33d Street, New York, N. Y., is priced at $3.00 a copy.

The William Parks Paper Mill at Williamsburg—This booklet of 44 pages, designed and printed by C. Harold Lauck at the Journalism Laboratory Press, Washington and Lee University, Lexington, Virginia, is a reprint of a paper which was read before The Bibliographical Society of America, June 23, 1937, in New York City. Revisions to the original text, as well as additions to it, have been incorporated in the reprint. The author, Rutherfoord Goodwin, is Director, Department of Education, Colonial Williamsburg, Inc., Williamsburg, Virginia. Printed in limited edition, each copy is signed and numbered. Set in Linotype Baskerville by Mr. Lauck and bound with paper cover by Ida Baskerville Lauck, the work is unusually attractive. It includes several interesting illustrations, among which are some of Parks' watermarks. Paper used for the flyleaves was produced in color, texture and watermarks to resemble as near as possible the product of Parks' mill which was established in 1744, the earliest paper mill to be built in the United States south of Pennsylvania. The price of the publication, as given by the Journalism Laboratory Press, is $2.00 a copy.

Sulphated Oils and Allied Products—This monograph, jointly prepared by Donald Burton and George F. Robertshaw, is a volume of nearly 175 pages. It not only presents a historical survey of the subject covered by its title, but also discusses raw materials and methods of sulphation, the chemistry of sulphation, the analysis of sulphated oils, the analysis of sulphated fatty alcohols, and the analysis of petroleum sulphonic acids. The book likewise includes an author index as well as a subject index. Published by Chemical Publishing Co., Inc., 148 Lafayette Street, New York, N. Y., the book is priced at $5.00 a copy.

The Tools of the Chemist—This book, written by Ernest Child, is divided broadly into three parts. Part I treats of peoples and events in American Chemistry. Part II discusses the ancestry and development of American chemical laboratory apparatus. Consideration is given in this section of the book to balances, glassware, porcelain ware, silica ware, filter paper, heating apparatus, metal laboratory ware, platinum, Alundum, rubber ware, and optical apparatus. Part III highlights some of the distributors of laboratory apparatus. The book is nicely illustrated and most attractively bound. It is a volume of more than 200 pages. Priced at $3.50 a copy by Reinhold Publishing Corporation, 330 West 42nd Street, New York, N. Y., it is a volume that should prove of interest to chemists, technologists, and others associated with the pulp and paper making industry.

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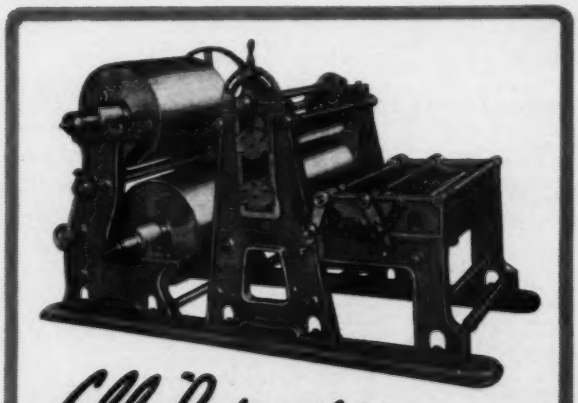

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RAGS (Domestic)
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NEW RAGS

	per cwt.	
Blue Overalls	4.75 to	5.00
Corduroy	2.50 to	2.75
Cottons—		
Washables, No. 1	2.00 to	2.25
Fancy Percales	3.75 to	4.00
New Soft Blacks	3.50 to	3.75
New Light Seconds	1.75 to	2.00
New Dark Seconds	1.60 to	1.75
Khaki Cuttings—		
Mixed	2.75 to	3.00
O. D.	3.25 to	3.75
New Canvas	7.75 to	8.25
New Mixed Blacks	2.50 to	2.75
Shirt Cuttings—		
New White No. 1	7.50 to	7.75
Silesias No. 1	4.50 to	4.75
New Unbleached	7.50 to	7.75
Fancy	2.25 to	2.50

RAGS (Domestic)
f. o. b. New York City

OLD RAGS

Roofing—	per cwt.	
No. 1	1.00 to	1.15
No. 2	.90 to	.95
No. 3	.80 to	.85
Twos and Blues—		
Repacked	1.90 to	2.15
Thirds and Blues—		
Repacked	1.70 to	1.85
Miscellaneous	1.50 to	1.60
White, No. 1—		
Repacked	3.00 to	3.25
Miscellaneous	2.75 to	3.00
White, No. 2—		
Repacked	2.50 to	2.75
Miscellaneous	2.00 to	2.25

RAGS (Foreign)
ex dock New York City

NEW RAGS

	per cwt.
New Dark Cuttings	Nominal
New Mixed Cuttings	
New Light Silesias	
Light Flannelettes	
Unbleached Cuttings	
New White Cuttings	
New Light Oxfords	
New Light Prints	

RAGS (Foreign)
ex dock New York City

OLD RAGS

	per cwt.
No. 1 White Linens	Nominal
No. 2 White Linens	
No. 3 White Linens	
No. 4 White Linens	
No. 1 White Cottons	
No. 2 White Cottons	
No. 3 White Cottons	
No. 4 White Cottons	
Extra Light Prints	
Ord. Light Prints	
Med. Light Prints	
Dutch Blue Cottons	
French Blue Cottons	
French Blue Linens	
Checks and Blues	
Linsey Garments	
Dark Cottons	
Old Shopperies	

ROPE and BAGGING
f. o. b. and ex dock New York City

Gunny No. 1—	per cwt.	
Foreign	2.50 to	2.60
Domestic	2.50 to	2.60
Wool Tares—		
Light	2.35 to	2.50
Heavy	2.50 to	2.60
No. 1 Scrap Bagging	2.25 to	2.40
Manila Rope—		
Foreign	4.50 to	4.75
Domestic	4.75 to	5.00
New Burlap Cuttings	3.25 to	3.50
Jute Threads—		
Foreign	3.25 to	3.50
Domestic	3.00 to	3.25
Strings—		
Sisal	2.25 to	2.50
Soft jute	3.25 to	3.50
Mixed	1.00 to	1.25

WASTE PAPER
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Shavings—	per cwt.	
White Envp. Cuttings	2.85 to	3.00
Ord. Hard White No. 1	2.25 to	2.50
Ord. Soft White No. 1	1.90 to	2.15
Soft White, Extra	2.50 to	2.65
Flat Stock—		
Stitchless	.85 to	.95
Overissue Mags	.75 to	.85
Solid Flat Book	.65 to	.75
Crumpled No. 1	.55 to	.60
Solid Ledger Books	1.60 to	1.70
Ledger Stock—		
White	1.45 to	1.55
Colored	1.00 to	1.10
New B. B. Chips	.20 to	.25
Manilas—		
New Env. Cuts	1.90 to	2.00
New Cuttings	1.50 to	1.60
Sulphite Mill Wrappers	.30 to	.35
No. 1 Old Kraft	1.05 to	1.15
News—		
No. 1 Wh. News Cuttings	1.40 to	1.50
Strictly Overissue	.55 to	.65
Strictly Folded	.35 to	.40
No. 1 Mixed Paper	17½ to	22¾

CHEMICALS
f. o. b. shipping point

Alum (Papermakers)—		
Lump, cwt.	3.75 –	
Ground, cwt.	3.50 –	
Powdered, cwt.	3.90 –	
Blanc Fixe—		
Pulp, bulk, ton	35.00 to	40.00
Dry, barrels, pound	.0300 to	.0400
Bleaching Powder—		
Drums, cwt.	2.00 to	3.00
Casein (Domestic Standard)—		
20-30 mesh (bags), lb.	10.00 to	10.50
80-100 mesh (bags), lb.	11.00 to	11.50
Argentine, lb.	9.50 to	10.00
China Clay—		
Domestic Filler		
Bulk (mine) ton	7.50 to	15.00
Domestic Coating		
Bulk (mine) ton	11.00 to	22.00
Imported (ship side)		
Bulk (lump) ton	13.00 to	25.00
Chlorine—		
Tank cars (wks) cwt.	1.75 to	1.90
Gelatine (silicin), lb.	.53 to	.55
Glyc. (C.P.) drums, lb.	.1250 to	.1300
Litharge, powd., bbl., lb.	.0775 to	.0800
Rosin (Gum)—		
New York, 280 lb. barrel		
E, per bbl.		6.50
F, per bbl.		6.80
G, per bbl.		6.85
WW, per bbl.		7.80
Rosin (Wood), per bbl., carlots	4.60 to	7.00
Salt Cake—		
Dom. bulk (wks) ton	16.00 to	17.00
Imp. bulk on dock—		
(Atl. ports) ton	20.00 to	
Soda Ash—		
Bulk (works) cwt.	.90 to	.95
Paper Bags, cwt.	1.05 to	1.35
Barrels, cwt.	1.05 to	1.35
Soda (Caustic)—Ammonia,		
Solid, drums, cwt.	2.30 –	
Ground and flake, drums, cwt.	2.75 –	
Sodium Silicate—		
60 deg., 55 gal. drums, (works) cwt.	1.65 to	2.00
40 deg., 35 gal. drums, (works) cwt.	.80 to	1.20
Starch—		
Pearl, 140 lb. bags, cwt.	2.45 –	
Pearl, barrels, cwt.	2.70 –	
Paper (Sp.) bags, cwt.	2.55 –	
barrels, cwt.	2.80 –	
Sulphur (crude)—		
(mine) bulk, long ton	16.00 to	20.50
Talc—		
Dom. 100 lb. bags (mine) ton	15.00 to	18.00
Imp. bulk, ton	23.00 to –	
Titanium Dioxide—		
Barium Pig., bbls., lb.	.05¼ to	.05½
Calcium Pig., bbls., lb.	.05 to	.05¼
Zinc Sulphide, bbls., lb.	.07½ to	.07¾

CHEMICAL PULP
(Air-dry ton)

Soda (Dom.) del'd. mill—	per cwt.	
Bleached, contract	2.90 –	
Sulphate (Dom.) f. o. b. mill—		
Bleached	3.50 to	3.75
Kraft No. 1	2.50 to	2.65
Kraft, Southern, del.	2.25 to	2.50
Sulphate (Imp.) on dock—		
Bleached	3.50 to	4.00
Kraft No. 1	2.50 to	2.75
Kraft No. 2	2.35 to	2.50
Sulphite (For.)		
On dock—		
Prime bleached	3.25 to	3.50
Prime easy bleach	3.00 to	3.25
Prime strong unbl.	2.75 to	3.00
Sulphite (Dom.)		
Bleached, contract	3.07½ to	
Unbleached, contract	2.62½ to	2.75

MECHANICAL PULP
(Air-dry ton)

	per ton	
No. 1 Dom. & Can. (f. o. b. pulp mill)	30.00 to	33.00
No. 1 Imp. (On dock)—		
Moist	38.00 to	42.00
Dry	40.00 to	45.00

PAPER
f. o. b. New York City

Boards—	per ton	
Binders	72.00 to	78.00
Chip	30.00 to	35.00
Chip, agi. mla. lined	50.00 to	55.00
Coated, white patent		
.016	70.00 –	
.020 and heavier	65.00 –	
Kraft liner	55.00 –	
News	30.00 to	35.00
Book (eased)	per cwt.	
No. 1 Glossy Coat	11.90 to	13.50
No. 2 Glossy Coat	10.35 to	11.75
No. 3 Glossy Coat	9.55 to	11.00
No. 4 Glossy Coat	9.15 to	10.50
No. 2 Offset	7.70 to	9.00
A Grade M. F.	6.40 to	7.15
A Grade Super	6.65 to	7.40
B Grade M. F.	5.95 to	6.70
B Grade Super	6.20 to	6.95
B S. & S. C. Litho	6.45 to	7.20
B M. F. Litho	6.20 to	6.95
Ivory & India	.50 cwt.	extra
Bonds (Rag Content)—		
100% Rag	per cwt.	
Ext. No. 1	39.10 to	46.00
100% Rag	31.05 to	36.50
85% Rag		
75% Rag	23.60 to	27.75
65% Rag	20.50 to	25.00
50% Rag	17.55 to	21.50
25% Rag	14.65 to	17.75
Regular Colors	1.00 cwt.	extra
Bonds (Sulphite)—	per cwt.	
No. 1	8.95 to	11.00
No. 2	8.05 to	9.75
No. 3	7.60 to	9.25
No. 4	7.30 to	9.00
Colors	1.00 cwt.	extra
Glassine (f. o. b. mill)—	per cwt.	
Embossed (25 lb. up)	12.75 –	
Bleached (25 lb. up)	11.75 –	
Unbleach. (25 lb. up)	10.50 –	
Greaseproof—		
Bleach. (25 lb. up)	10.25 –	
Unbleach. (25 lb. up)	9.25 –	
Ledgers (Rag Content)—		
100% Rag	per cwt.	
Ext. No. 1	40.25 to	47.25
100% Rag	32.20 to	37.75
85% Rag	29.90 to	35.00
75% Rag	24.75 to	29.00
65% Rag	21.65 to	26.25
50% Rag	18.70 to	22.75
25% Rag	15.80 to	19.25
Regular Colors	1.00 cwt.	extra
Ledgers (Sulphite)—	per cwt.	
No. 1	10.10 to	12.25
No. 2	9.25 to	11.25
No. 3	8.50 to	10.75
No. 4	8.50 to	10.25
News—	per ton	
Rolls (Contract)	50.00 –	
Rolls (Spot)	(nominal)	
Sheets	58.00 –	
Tissues (Carlots)—	per ream	
White, No. 1	.92½ –	
White, No. 2	.85 –	
Anti-Tarnish M. G.	.80 –	
Colored	.87½ –	
Kraft	.80 –	
Manila	.65 –	
Napkins, semi-crepe (12½ lb. to M shts.) per cs.	.41 –	
Napkins, full crepe and emb'sed (12½ lb. to M shts.) per cs.	.43½ –	
Toilet, Bleached (M shts.) per cs.	5.80 –	
Toilet, Unbleached (M shts.) per cs.	3.50 –	
Towels—	per case	
Bleached	3.10 to	3.65
Unbleached	1.95 to	3.30
Wrappings (Kraft)—	per cwt.	
Extra Quality	5.00 to	5.50
Super-Standard	4.62½ to	5.00
Northern Standard	4.25 to	4.50
Southern Standard	4.00 to	4.25
Wrappings (Sulphite and Bleached Kraft)— (Rolls, f. o. b. mill)		
Bleached papers—	per cwt.	
M.F. & M.G. Waxing, 20 lb. (Carloads only)	6.15 –	
(10,000 lbs.)	6.40 –	
Drug wrapp. 35 lb.	6.25 –	
Unbleached Papers—		
Com. Grd. Butch. 40 lb.	4.50 –	
No. 1 Butchers	4.75 –	
No. 1 Imit. Parch & Dry Fin. Groc. Sulphite 30 lb.	5.00 –	
No. 2 Imit. Parch & Dry Fin. Groc. Sulphite 30 lb.	4.75 –	
Steam Finish, 50 lb.	4.00 –	
Water Finish, 40 lb.	4.50 –	
Manilas—		
Envp. Mla., Sub. 16-40 (No. 1)	5.00 –	
Envp. Mla., Sub. 16-28 (No. 2)	4.75 –	
Envp. Mla. (Prices based on large sheets untrim'd ream-marked, in bdls.)		
Wrapp. Mla. 35 lb. up—		
No. 1	5.25 –	
No. 2	5.00 –	
M. G. Sulphite and Kraft (other than Waxing)		
Grade A-25 lb.	5.75 –	
Grade B-25 lb.	5.25 –	